Longspine Thornyhead Random Stratified Trawl Survey off the West Coast of Vancouver Island, September 6-23, 2002

P. J. Starr, B. A. Krishka, and E. M. Choromanski

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LONGSPINE THORNYHEAD RANDOM STRATIFIED TRAWL SURVEY OFF THE WEST COAST OF VANCOUVER ISLAND, SEPTEMBER 6-23, 2002

by

P. J. Starr[1], B. A. Krishka[2] and E. M. Choromanski[2]

[1]Canadian Groundfish Research and Conservation Society
1406 Rose Ann Drive
Nanaimo, B.C.
V9T 4K8

[2]Fisheries and Oceans Canada
Science Branch, Pacific Region
Pacific Biological Station
Nanaimo, B.C.
V9T 6N7

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ABSTRACT

Starr, P.J., Krishka, B.A., and Choromanski, E.M. 2004. Longspine thornyhead random stratified trawl survey off the west coast of Vancouver Island, September 6-23, 2002. Can. Tech. Rep. Fish. Aquat. Sci. 2558: v + 81 p.

The second of three annual bottom trawl surveys was conducted from September 6-23, 2002 to estimate relative thornyhead biomass off the west coast of Vancouver Island. This survey was extended in 2002 to 50°30' N latitude by adding a new areal stratum to accommodate changed management boundaries for longspine thornyheads. Net mensuration gear provided additional measures of gear performance but bottom contact sensors appeared to be less reliable than in 2001. Sixty-seven valid tows were used for biomass estimation and over 80% of the total catch weight of 29,700 t consisted of six species (roughscale rattail *Coryphaenoides acrolepis*, longspine thornyhead *Sebastolobus altivelis*, sablefish *Anoplopoma fimbria*, shortspine thornyhead *Sebastolobus alascanus*, pectoral rattail *Albatrossia pectoralis* and Dover sole *Microstomus pacificus*). Biomass estimates in 2002 for these species had relative errors below 20%, and less than 10% for either thornyhead species. Comparison of these biomass estimates with those from the 2001 survey indicated that they were all similar for 12 of the top 13 species in terms of catch weight, excluding the added stratum, assuming a constant wingspread and calculating the tow duration from winch lockup to winch retrieval. A total of 456 biological samples were also taken from 17 species.

RÉSUMÉ

Starr, P.J., Krishka, B.A., and Choromanski, E.M. 2004. Longspine thornyhead random stratified trawl survey off the west coast of Vancouver Island, September 6-23, 2002. Can. Tech. Rep. Fish. Aquat. Sci. 2558: v + 81 p.

Le deuxième de trois relevés annuels au chalut de fond, mené du 6 au 23 septembre 2002, visait à estimer la biomasse relative des sébastolobes au large de la côte ouest de l'île de Vancouver. En 2002, on a étendu la zone du relevé jusqu'à 50°30' de latitude N en y ajoutant une nouvelle strate surfacique pour tenir compte des limites modifiées de gestion du sébastolobe à longues épines. Des capteurs installés sur le chalut ont fourni des mesures additionnelles de la performance du train de pêche, mais les capteurs enregistrant le contact avec le fond semblaient être moins fiables qu'en 2001. Soixante-sept traits de chalut valides ont été utilisés pour estimer la biomasse. Plus de 80 % du poids total des prises de 29 700 t étaient composés de six espèces : grenadier à écailles rudes (*Coryphaenoides acrolepis*), sébastolobe à longues épines (*Sebastolobus altivelis*), morue charbonnière (*Anoplopoma fimbria*), sébastolobe à courtes épines (*Sebastolobus alascanus*), grenadier pectoral (*Albatrossia pectoralis*) et sole à petite bouche (*Microstomus pacificus*). Les erreurs relatives des estimations de la biomasse de ces espèces en 2002 étaient inférieures à 20 %; elles étaient de moins de 10 % pour les deux espèces de sébastolobes. En comparant les données de 2002 avec celles de 2001, on a constaté que les estimations étaient toutes semblables pour 12 des 13 premières espèces en termes de poids des prises lorsqu'on omettait la strate ajoutée, en présumant un écartement constant des ailes du chalut et en calculant la durée du trait à partir du blocage du treuil jusqu'au hissage du filet. Au total, 456 échantillons biologiques ont également été prélevés chez 17 espèces.

INTRODUCTION

Longspine thornyhead (*Sebastolobus altivelis*) and shortspine thornyhead (S. *alascanus*) were identified as likely candidates for a random stratified trawl survey based on analysis of commercial trawl information (Starr and Schwarz 2000). Considerable consultation with the Canadian Groundfish Research and Conservation Society (CGRCS), Fisheries and Oceans Canada (DFO) science and management staff, fishing industry representatives, Simon Fraser University, and the U.S. National Marine Fisheries Service (NMFS) led to an initial survey design that was implemented in 2001 aboard the F/V *Viking Storm*. The design, methods and preliminary results of the 2001 survey are found in Starr et al. (2002).

The 2002 thornyhead biomass survey is the second of three surveys planned for 2001-2003 to estimate thornyhead biomass off the west coast of Vancouver Island. The 2002 survey was completed aboard the F/V *Ocean Selector* since the F/V *Viking Storm* was unable to continue its 3-year contract for 2001-2003. Changes to the 2002 survey are documented in the current report, such as addition of a 7th areal stratum, modifications to data collection methods, and the collection of additional fishing gear characteristics during each tow.

SURVEY OBJECTIVES

The 2002 survey objectives remain the same as 2001 objectives, namely:

1. To estimate the relative abundance of longspine thornyhead lying between a southern boundary defined by the Canada-US border north to 50° 30' N within the 500-1,600 metre depth range. The target relative error of the longspine thornyhead biomass estimate is 20% $\left(RE = SE/\mu\right)$ (where μ is the biomass estimate from the survey and SE is the standard error of that estimate).
2. To estimate the distribution by size class and sex category of the longspine thornyhead population within the extent of the survey area, given the uncertainty that results from sampling with non-representative fishing gear.
3. To obtain quantitative biological information pertaining to selected finfish and invertebrate species.

METHODS

STRATUM DEFINITIONS

The initial design (Starr et al. 2002) proposed six areal strata (regions) and three depth zone strata for a total of 18 strata. Addition of a 7th areal stratum in 2002 allowed the survey design to cover the entire southern management area whose northern limit was recently redefined as 50° 30' N latitude (DFO 2002). Table 1 defines the 21 strata used in 2002 and provides two surface areas associated with each stratum: 1) total estimated area in km^2 and 2) trawlable area remaining after untrawlable grounds are excluded. Figure 1 illustrates the regional and depth stratification boundaries while marking acceptable/excluded tows plus trawlable locations. Untrawlable grounds were identified by Chris Roberts, a skipper experienced in fishing for longspine thornyheads, during a preliminary scoping exercise held in 2001. This exercise was

not done for Region G (Quatsino), thus the values in Table 1 are the same for both trawlable and untrawlable areas within this region.

VESSEL AND GEAR

The commercial fishing vessel chartered for the 2002 survey was the 47.9-metre stern trawler F/V *Ocean Selector*. Dave Clattenberg was skipper and fishing master. The use of this vessel represented a change from the 2001 longspine survey (Starr et al. 2002), as the previous vessel, the F/V *Viking Storm*, could not complete the full 3-year contract. The new vessel contained suitable accommodations for 4 additional survey staff, and had an enclosed area for catch sampling. Onboard freezers were available to preserve samples for later processing or identification.

Trawl gear consisted of one Atlantic Western No. II box trawl as the primary gear, plus an identical net onboard as a backup. The same net design was used during 2001 and is a design that is commonly used by commercial thornyhead fishermen. Net specifications are provided in Figure 2. Thyboron 107 trawl doors were used for consistency with the 2001 survey. A heavier warp cable was used in 2002 compared to 2001 because it was already installed on this vessel and was deemed necessary by the new skipper due to the maximum fishing depths specified in the survey design.

Some differences, which were not noted until the beginning of the 2003 survey, arose in the way the net was rigged between the 2001 and 2002 survey years. The F/V *Ocean Selector* used a lighter footrope, less buoyancy on the headrope, and shorter sweep wires (G. Workman, DFO, Nanaimo, pers. comm.). Similar doors (Tyboron 107) were used both years. Schnute et al. (2004) incorrectly stated that different doors were used in 2002. Skipper Dave Clattenberg indicated that, in his opinion, these changes would have a very minor effect on longspine catchability. Nevertheless, differences in the net design between 2001 and 2002 have introduced a potential catchability change that cannot be quantified, as did the change in the survey vessel.

SCANMAR Net monitoring equipment (Scanmar AS, Norway, http://www.scanmar.no/) was installed for the 2002 survey to display fishing characteristics of the net while a tow was in progress. The system consisted of four sensors that mounted on the net, plus associated receiver and processing equipment on the bridge to display information. Net sensors provided real-time data for doorspread, wingspread, headline height, water temperature at the net, water velocity at the net and net depth. A monitor on the bridge displayed output from these sensors. Survey staff manually recorded these data approximately every five minutes during the tow because the vessel equipment could not electronically capture the information. Initial readings were taken when the net contacted bottom (based on readings from the net sensors) and ceased when the winch was released for net retrieval. The following information was recorded at each interval: time, bottom depth, latitude, longitude, warp length, wind speed, wind direction, vessel direction and vessel towing speed. Total distance traveled by the net was calculated from these interval observations by multiplying the elapsed time for each interval with the vessel speed for that interval. Vessel speed was the average of the speeds at the start and end of each interval.

A bottom contact sensing device provided by M. Wilkins (NOAA/NMFS, Seattle, Washington) monitored net contact with bottom during survey tows, although the device did not function successfully in all cases. This device measured tilt angle, with an angle of 0° indicating that the device was hanging vertically in the water and 90° indicating that the device was horizontal. The device attached to the trawl foot rope using a short chain, and presumably indicated contact between the net and bottom when the angle measured greater than 80°. A

built-in data logger within the device recorded tilt angle every 6 seconds after synchronizing the clock within the data logger to the Global Positioning System (GPS) clock each morning. Data logger contents were downloaded to an onboard computer after every tow to assess whether the completed tow met the design criteria for tow duration. Acceptable tows within Regions A-D needed at least 30 minutes of bottom contact time, with 15 minutes or more required in Regions E-G.

SITE SELECTION AND TOW ACCEPTANCE

The process by which a tow was accepted for biomass estimation included: 1) random station selection, 2) on-site validation of station criteria, 3) successful completion of the tow, and 4) verification of minimum bottom contact.

During the planning phase, the area within the survey boundaries (Figure 1) was overlaid with a 500 m x 500 m square grid which defined a set of uniquely numbered grid cells. A list of 25 cell numbers were randomly selected for each area/depth stratum combination and the center points of these cells became the station coordinates. Interpolated depth contours from the survey grid database estimated station depths for the random site selection process. Onboard equipment determined the actual depths considered for tow selection criteria at each station.

The skipper received a list of random stations for each stratum at the beginning of the charter. When conducting the survey, the skipper followed a procedure of confirming acceptable depth and site conditions by sequentially inspecting and then either rejecting or fishing the selected stations within a stratum. The design protocol specified that the initial stations on the list (2 or 4 stations depending on stratum requirements) must be fished unless a station could be rejected for one of the following reasons:

- the station did not meet the area/depth stratum definition (e.g., depth of the random station was not within the specified depth zone or the station was outside the stratum boundaries);
- the station was considered untrawlable due to bottom topography or other obstacles such as known snags. The skipper was encouraged to select another station if there was a significant danger of losing the net or of not achieving adequate bottom contact time;
- the tow overlapped significantly with a previously completed tow.

If a station was rejected, then the skipper proceeded to the next station on the list, which was then evaluated using the same criteria.

A tow was deemed successful when: 1) it passed within 250 m of the center of the station coordinates, 2) the catch was not compromised by fouled or damaged gear, and 3) the net remained on bottom within the stratum definition for one-half hour of bottom contact time (defined as being greater than 80° tilt angle of the bottom contact sensor). The skipper could choose any approach line which achieved this standard.

The definition of a successful tow was relaxed for the three northern Regions (E-G) since bottom topography in these areas is less suitable for bottom trawl gear. Bottom contact requirements were reduced to 15 minutes of bottom contact time and the skipper was only required to pass within 2 km of the random station at some point during the tow.

As the survey progressed, it became apparent that the definition of bottom contact (i.e., cumulative time at 80° or more based on bottom contact sensor data) was very difficult to achieve, either because the bottom contact sensor functioned differently than in 2001 or because

of differences in fishing techniques caused by variations in vessel or skipper methodologies. Therefore, bottom contact based on the bottom contact sensor was redefined as the cumulative time at angles greater than 45°. This definition conforms to the definition used by the NFMS (M. Wilkins, NOAA/NMFS, Seattle, Washington, *pers. comm.*).

CATCH AND SAMPLE PROCESSING

Catches were released into the hopper on deck and transferred along a conveyor belt to the sampling area. The sampling crew was stationed alongside the belt and sorted species or species groups into separate sampling baskets for bulk weighing. Non-target (minor) species had the number of specimens counted, if possible, and a total basket weight was recorded for each species. Target (major) species required a specific sampling protocol that was species dependant (Table 2). All specimens of each target species were measured unless the species catch consisted of more than 100 individuals, in which case subsampling took place. Catches were systematically subsampled in proportion to the estimated number of fish caught, so that a reasonable number of fish could be processed for required attributes. For example, if 600 fish were estimated in the species catch, 1 in every 6 fish would be selected without regard to size or sex, thus providing a subsample of approximately 100 specimens. The procedure was repeated with a larger proportion of the total species catch if the initial subsample was too small.

A large capacity, motion-compensating electronic balance (Marel Model M1100) provided weights of species catches within each basket to estimate the total catch by species. A smaller balance was used to measure weights for individual specimens being sampled for otoliths.

Maturity stages were recorded for eight target species (Table 2) using established maturity codes for flatfish (Appendix B) and rockfish (Appendix C). Simplified maturity codes were used for thornyheads again in 2002 due to the difficulty in visually classifying stages (see Appendix A1).

Collection of ageing structures included otoliths from longspine thornyhead, shortspine thornyhead, Dover sole, sablefish, turbot and two rockfish species (Table 2). Based on catch and sample collections from 2001, the overall numbers of otoliths were length-stratified by sex for thornyheads, sole and sablefish (Table A5 in Appendix A) to ensure adequate sampling from the expected length ranges.

DATA ANALYSIS

Requirements for site suitability and acceptable bottom contact time were defined to estimate target species biomass with a specified level of confidence ($RE \leq 20\%$). Equations 1, 2, 4 and 5 below have been modified from Appendix D in Starr et al. (2002) to accommodate more realistic estimates of doorspread available from 2002 net sensor data.

The biomass estimate (B_s) for species s from the survey was calculated in kg as follows:

$$B_s = \sum_i C_{s_i} A_i \qquad \text{Eq. 1}$$

where C_{s_i} = mean CPUE density (kg/km^2) for species s in stratum i

A_i = area of stratum i (km^2)

The variance of the survey biomass estimate V_{B_s} for species s was calculated in kg^2 as follows:

$$V_{B_s} = \sum_i {V_{s_i} A_i^2} / {n_i} \qquad \text{Eq. 2}$$

where V_{s_i} = variance of CPUE (kg^2/km^4) for species s in stratum i

n_i = number of observations in stratum i

The distance traveled in km (D_{ij}) by tow j in stratum i was calculated from intermediate observations within a tow where elapsed time and speed were noted at approximate 5-10 minute intervals:

$$D_{ij} = \sum_t S_{ijt} T_{ijt} \qquad \text{Eq. 3}$$

where S_{ijt} = speed (km/h) for tow j in stratum i over time interval t

T_{ijt} = length of time interval t (h) for tow j in stratum i

C_{s_i} (Catch per unit area (kg/km^2) for species s) was then calculated in one of two ways:

$$C_{s_i} = \frac{\sum_j \left({W_{ij}} / {D_{ij} w_{ij}} \right)}{J_i} \qquad \text{Eq. 4}$$

where $W_{s_{ij}}$ = catch weight (kg) for species s in stratum i and tow j

w_{ij} = wingspread width (km) for tow j in stratum i

J_i = number of tows in stratum i

or:

$$C_{s_i} = \frac{\sum_j \left({W_{s_{ij}}} / {\left[\frac{H_{ij}}{E_{ij}} D_{ij} w_{ij} \right]} \right)}{J_i} \qquad \text{Eq. 5}$$

where H_{ij} = elapsed time (h) with confirmed bottom contact for tow j in stratum i

E_{ij} = elapsed time (h) between winch lockup and tow retrieval for tow j in stratum i

Therefore, the estimated distance traveled $\left(D_{ij}\right)$ was reduced by the ratio of the estimated bottom contact time with the time estimated from winch lockup to net retrieval $\left(H_{ij}/E_{ij}\right)$.

When investigating the data to determine the benefits of stratification, the estimate of variance provided in Eq. 2 must be adjusted upward to provide an estimate of variance without stratification (Cochran 1977; Section 5a.11, page 136):

$$\hat{V}_{B_s}^{nostrat} = \frac{1}{n}\left[A\sum_{i=1}^{I}\frac{A_i}{n_i} SS_i - B_s^2 + V_{B_s} \right] \qquad \textbf{Eq. 6}$$

where $\hat{V}_{B_s}^{nostrat}$ is the adjusted variance estimate, A and n are respectively the total area and total number of tows for the complete survey, and SS_i is the sum of squares of the CPUE term as defined in Eq. 4 or Eq. 5.

Equation 6 can be modified to estimate the variance for other stratification schemes (such as by depth zone or by area). The estimated variance would be calculated across all areas (for a depth zone effect) or across all depths (for an area effect), with the A, n, B_s and V_{B_s} terms modified to fit the summarization option chosen. The variances are then summed to give a total variance for the survey.

The precision of the survey is often expressed in terms of the relative error (*RE*) which is approximated from the values obtained in Eq. 1 and Eq. 2:

$$RE_{B_s} = \frac{\sqrt{V_{B_s}}}{B_s} \qquad \textbf{Eq. 7}$$

where RE_{B_s} is the relative error for the biomass index for species s.

The relationship of weight from length is usually expressed as follows (Quinn & Deriso 1999):

$$Z_{sijk} = a_s L_{sijk}^{b_s} e^{\varepsilon_{sijk}} \qquad \textbf{Eq. 8}$$

where Z_{sijk} is the weight of observation k of species s with length L_{sijk} from tow j in stratum i, a_s and b_s are species regression constants and e_{sijk} is a random error term with mean 0 and constant variance s^2.

The sample for any species was scaled up to the catch in the sampled tow as follows:

$$S_{sijk} = \frac{Z_{sijk}}{\sum_k Z_{sijk}} W_{s_{ij}} \qquad \textbf{Eq. 9}$$

where S_{sijk} is the scaled weight (kg) of observation k of species s from tow j in stratum i.

As S_{sijk} is equivalent to the catch weight $\left(W_{s_{ij}}\right)$ in Eq. 4 and Eq. 5, S_{sijk} can be substituted into these equations instead of $W_{s_{ij}}$ and then the corresponding CPUE estimate can be used in Eq. 1 and Eq. 2 to calculate the mean and standard error of any sub-group of the biomass. Length distributions were calculated by binning the lengths into 1 cm intervals (for longspine thornyheads) and into 5 cm intervals (for shortspine thornyheads, the two rattail species and Dover sole).

RESULTS AND DISCUSSION

TOW FREQUENCY AND DISTRIBUTION

The charter began September 6th, 2002 when CGRCS/AMR/DFO survey staff boarded the survey vessel in Victoria. Paul Starr (CGRCS - lead scientist), Ed Choromanski (DFO) and two AMR staff (Bruce Bifford, Chris Homan) were the scientific crew. The first tow was completed on September 7th. Mike Orcutt (AMR) replaced Paul Starr on September 10th. The final tow was completed September 23rd for a total elapsed period of 17 days. Only one day (September 19th) was lost due to poor weather. Four to six tows were generally completed per day, with a mode of five tows.

Seventy-four tows were attempted, of which 67 were accepted for calculating species biomass indices and seven were rejected (Figure 1; Tables 3 and 4). Tows were rejected for several reasons, including poor bottom contact, poor net performance, failure to cross the random survey point or problems with net performance (Table 4).

Table 5 summarizes the 113 random tow locations that were not selected and the reasons for rejection. Over 50% of the rejected random tow locations were sites that were skipped in Regions F and G (Cape Cook/Winter Harbour and Quatsino) and most of these sites were in Region G. Unfortunately, the reasons for rejecting these stations were not logged, but the skipper's decision must still be considered valid on the basis of the site selection criteria. Of the 49 random locations that were not selected for reasons other than skipping the location, 26 locations did not meet the stratum criteria and 23 sites were deemed unsuitable for trawling by the skipper due to bottom terrain.

NET MENSURATION

The frequency distribution of distance traveled for valid tows shows that the majority of tows lasted between 4 and 7 km (2.2 to 3.8 nmi; Table 6; Figure 3). This was a broader range of distances than observed for the 2001 survey where the range was from 4 to 6 km (Starr et al. 2002). One valid tow traveled only 2.7 km and three tows continued for more than 9 km. The distribution of average tow speeds was clustered between 4.2 and 5.0 km/h (2.3-2.7 nmi/h; Table 6; Figure 4) with a few tows outside of that range. There were 10 tows with speeds greater than 5.0 km/h (2.7 nmi/h) and the maximum observed speed was 5.7 km/h (3.1 nmi/h). The average vessel speed for the 2002 survey (4.6 km/h) was higher than that observed for the 2001 survey (4.2 km/h). Dave Clattenberg (*pers. comm.*) noted that the Tyboron trawl door stability may be compromised at the slower speeds recommended in the survey protocol and this probably accounts for the increase in average tow speed.

Vessel speed and location must be used as surrogates for net speed and location because suitable GPS sensors on the net were not available for this survey. The relationship between water velocity through the net and tow speed should be explored since surface and bottom conditions can vary considerably due to tides, currents, surface winds, bottom topography and other factors.

Mean doorspread was reasonably constant around 56 m (Table 6; Fig. 4), although one set in the deepest stratum had a mean doorspread just less than 40 m. The maximum observed mean doorspread was 61 m. Mean wingspread was just below 17 m (Table 6; Fig. 4), with one low outlier just below 14 m (Table 8). The mean doorspread associated with this outlier was 48.6 m while the minimum mean doorspread (39.8 m) had a mean wingspread of 15.3 m. The observed mean wingspread of 17 m for this survey is lower than the mean wingspread that was assumed for the 2001 survey (20 m; Starr et al. 2002). Mean headline height was 4.0 m (Table 6; Fig. 4) but ranged from 2.0-6.2 m.

BOTTOM CONTACT SENSOR DATA

The interpretation of bottom contact data was more problematic for this survey than in 2001. Discussion with Mark Wilkins (NMFS, Seattle; *pers. comm.*) indicated that attachment of the sensor device was not done in the same manner as is considered standard in surveys conducted by the NMFS. The NMFS tends to use a rigid connection and keeps the device close to the footrope. Several configurations were tried for the 2002 survey, the final one attaching the device to the footrope using two lengths of chain about 1.2 m long. This attachment method was similar to that used in 2001 but appears to have resulted in variable performance by the bottom contact sensing device.

Three example bottom contact traces are provided in Figure 5. The first example (Set 17; upper panel; Figure 5) shows a trace which conforms well to expectations for how the net should behave: once the winch was locked, the net hit bottom approximately 6 minutes later (the tilt angle changed from <10° to >80°). The tilt angle remained above 80° until about 3 minutes after the net was retrieved, when it clearly left the bottom. Unfortunately, only about 15 of the 62 tows with usable bottom contact data conformed to this pattern. The second example (Set 44; center panel; Figure 5) shows a trace which also conforms to expectations for how the net should behave with respect to winch lockup and net retrieval, with the net arriving on bottom about 5 minutes after lockup and leaving bottom about 6 minutes after retrieval was initiated. However, the device clearly bounced a great deal while it was on bottom given the many changes in the tilt angle from over 80° to less than 10° between the beginning and end of the tow. Finally, the third example (Set 51; lower panel; Figure 5) shows an extreme set where the net took about 14 minutes to reach bottom and appears to have left bottom 13 minutes prior to winch release when retrieving the net. Further investigation suggests either a sensor malfunction or a tangled bottom contact sensor that failed to capture the true time when the net left bottom. The device also shows the bouncing behaviour described for Set 44.

An analysis of the time taken from winch lockup time until the net reached bottom appears reasonable, showing an expected increasing amount of time to reach bottom with increasing depth (Table 7). The mean time from lockup to bottom contact was about 6 minutes for the shallow stratum (501-800 m), increasing to a mean time of nearly 17 minutes for the deepest stratum (1201-1600 m). Similarly, time lags between the start of net retrieval and when

the net left bottom also appear to be reasonable, with the mean amount of time taken increasing from 1.5 minutes in the shallowest stratum to 5.5 minutes for the deepest stratum (Table 7).

Two sets reached the bottom before the stated winch lockup time (Figure 6), but the amount of difference is small (1.2 and 1.5 minutes prior to winch lockup time). These observations may be due to transcription errors or a lack of synchronization between the clock on the bottom contact device and the clock on the vessel GPS. More seriously, nine tows left the bottom before the stated net retrieval time (Figure 7). Again, the differences were generally small (1.7 to 4.6 minutes early) except for three tows where differences ranged from 11 to 13 minutes prior to the stated net retrieval time. These errors are also probably caused by the same reasons previously suggested: transcription errors or lack of synchronization between the clock on the bottom contact device and the clock on the bridge GPS.

Examination of the traces from the example tows provided in Figure 5 showed that both the moment of contact with bottom and the time the net left bottom were well defined from these traces. Even if the synchronization with the bridge GPS was poor, the elapsed time on bottom should be accurately established from the bottom contact trace as the change from a vertical to horizontal sensor orientation was very clear for every tow which had a usable trace. Therefore, every usable trace was carefully examined to determine the time when the net arrived and left bottom. The difference between these times was used as an estimate of the total time on bottom by assuming that the net was on bottom for the entire period between these events. This was done without reference to recorded tilt angles which is a departure from the procedure used to interpret bottom contact traces obtained in the 2001 survey. Comparison plots of the tow duration (defined as the time from winch lockup to winch release during net retrieval) with four measures of bottom contact time show the reason for this change in procedure (Figure 8). There is good correspondence between tow duration and bottom contact time estimated from bottom contact traces (upper left panel, Figure 8) but estimating bottom contact using tilt angle did not perform well and was abandoned for these data (other panels, Figure 8).

Ratios of total bottom contact time with tow duration (as defined in the caption for Figure 5) plotted against depth at the beginning of the tow show a slight decreasing trend with depth (Figure 9). This is an expected result, given the increasing time taken to reach bottom as shown in Table 7. A plot of the same ratios with vessel speed shows no trend (Figure 10), indicating that the slightly higher speeds observed in the 2002 survey compared to the 2001 survey are not the source of the problem with bottom contact sensor data.

Five valid survey tows did not have usable bottom contact traces (Table 8). Given that there is a suggested relationship between the ratio of bottom contact time and tow duration (see the caption to Figure 5 for definitions of these values; Figure 6), mean values of this ratio by depth stratum were used for these tows when calculating survey biomass indices based on Eq. 5. There was no difference in these ratios across the survey areal strata (ANOVA $F=0.812$, 6 df, $p=0.565$).

CATCHES AND CATCH RATES

Six species accounted for over 80% of the total catch by weight for the 67 valid survey tows (Table 9). The most abundant species by weight were, in order, roughscale rattail, longspine thornyheads and sablefish. Over 5 tonnes of catch were taken for each of these species, accounting for 53% of the 29.7 tonnes recorded for all species (Table 9).

Longspine thornyheads were taken in every valid tow (100% of 67 tows) while shortspine thornyheads (94%), sablefish (93%), pectoral rattails (91%) and roughscale rattail (88%) all were well represented in most of the survey tows (Table 9). The proportion of tows with positive catch drops quickly after these five species, with Dover sole (number 6 in rank) represented in only 69% of the valid tows. Going further down the list, Pacific flatnose (91% of the 67 valid tows), tanner crabs (88%) and deepsea sole (76%) were frequently represented in the catch, although not in great amounts (Table 9).

As seen in the 2001 survey, the design stratification captured differences in catch rates by depth for all the major species. Longspine thornyheads had the highest catch rates in the middle depth stratum (801-1200 m; Figure 11) while shortspine thornyheads (Figure 12), sablefish (Figure 13), and Dover sole (Figure 14) had their highest catch rates in the 501-800 m stratum. The two rattail species (Figures 15 and 16) had higher catch rates in the two deeper strata.

BIOLOGICAL DATA

Seventeen species provided 456 samples of biological data that included length and sex information (Table 10). Of the 20,446 specimens processed, maturity information was collected from 12 species (12,810 fish). Eleven species had weights (3,566 fish) and otoliths (3,558 fish) collected. Six target species had a total of 54 catches that lacked length information (Table 11).

Length-stratified otolith samples were collected for four species. Table 12 summarizes the numbers of longspine thornyhead specimens by sex that were sampled within each length bin. One quarter of these specimens could not be sexed reliably. Similar summaries for shortspine thornyheads, sablefish and Dover sole are found in Table 13, where the only unsexed fish was one shortspine thornyhead. Raw length frequency distributions for the 17 species (Figure 17) also illustrate frequencies of otoliths (and weights) collected by length intervals.

Length statistics for five target species are summarized in Table 14. Limited sample sizes from the deepest stratum (1201-1600 m) reflect relative sampling frequencies among depth strata and natural depth distributions by species.

Weight-length regressions for six species are illustrated in Figure 18. Data outliers are indicated in the plots, along with species regression equations, coefficients and sample sizes.

BIOMASS ESTIMATION

Trawlable areas were used to calculate species biomass estimates (Eq. 1 and Eq. 2) because untrawlable areas were excluded from the random station selection procedure. Region G (Quatsino) was not considered when untrawlable areas were originally demarcated, and that entire Region was deemed trawlable for the 2002 site selection process. This resulted in many more rejections of potential random trawl locations for Region G during the survey when compared to other regions (Table 5).

Biomass estimates were scaled to the mean wingspread width (Table 6; Fig. 4) estimated for each tow (Eq. 4 and Eq. 5). Using this quantity assumes that all fish within the wingspread width are captured and that there is no herding effect from the sweep ropes. Neither assumption

is likely correct and the degree of failure will not be consistent across species. For instance, the two thornyhead species appear to show little herding effect while Dover sole exhibit some herding (C. Roberts, skipper, F/V *Viking Storm*, pers. comm.). Biomass estimates presented in this section are based on the total catch weight in the net.

The biomass estimates in Table 15 are based on trawlable areas from Table 1. Biomass estimates based on estimated bottom contact time (Eq. 5) are higher than estimates based on the period from winch lockup to net retrieval (Eq. 4; Table 15 and Figure 19). The *RE*s for 9 of the 13 species presented in Table 15 are below the survey objective of 20%, including *RE*s that are less than 10% for both thornyhead species.

Preliminary biomass estimates by stratum and by species are highest within the same strata where the species catch rates are high (Table 16). Standard errors for these estimates are large due to low sampling effort in individual strata.

COMPARISON WITH 2001 BIOMASS ESTIMATES

A simple comparison of the biomass estimates from the two surveys is not possible because of the addition of a new areal stratum between the two years, the use of net mensuration devices in 2002 which were not available in 2001 and the different performance of bottom contact sensors in 2002. In order to make biomass estimates from the two surveys comparable, data from the 2002 survey were recalculated using the following restrictions:

1. Areal stratum G (Quatsino; Figure 1) was dropped as it was not surveyed in 2001.

2. A constant wingspread of 20 m was used for comparability with the assumption made in 2001.

3. Tow duration (Eq. 4: time from winch lockup to net retrieval) was used to calculate CPUE density.

The resulting biomass indices (Table 17; Figure 20) are comparable between the two surveys, particularly when error estimates are taken into account. The similarity of biomass estimates between surveys appears to indicate that the 2001 and 2002 survey are comparable, despite the change in survey vessel. Biomass estimates for longspine and shortspine thornyheads, the two rattail species and Pacific flatnose are very close in absolute value between the two years. Estimates for sablefish dropped by 24% and Dover sole rose by 27% in 2002 but are statistically equivalent given the size of relative errors (Figure 20). The only biomass estimate which appears to be significantly different between the two years is shortraker rockfish, which estimated a much larger biomass during the 2002 survey than was seen in 2001. Shortraker rockfish were much more abundant in 2002 than in 2001 when very few specimens were caught.

RECOMMENDATIONS

Several recommendations arise following the second year of this survey:

- ensure that length frequency data are collected for target species from every tow since these data were missed from several tows near the end of the survey;

- provide a means of computerized data capture from Scanmar net sensors;
- review Area G to identify untrawlable areas.

The third survey is scheduled for September 2003. After that survey is completed, all three years of data will be reviewed and analyzed.

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Table 1. Names and labels for seven areal strata and three depth zone strata used for the 2002 survey. The Quatsino stratum (G) was added for the 2002 survey. Trawlable area (km^2) is the estimated area after the removal of untrawlable areas identified prior to the 2001 survey by Chris Roberts (skipper of the F/V *Viking Storm*). Untrawlable areas in Region G were not identified prior to the 2002 survey.

Region	Name	Depth Zone (m)	Estimated Area (km^2)	
			Total	Trawlable
A	Barkley	501-800	487	384
		801-1200	702	637
		1201-1600	577	577
B	Loudon/Clayoquot	501-800	330	233
		801-1200	373	336
		1201-1600	694	694
C	Clayoquot/Estevan	501-800	265	238
		801-1200	380	380
		1201-1600	462	462
D	Nootka/500	501-800	274	154
		801-1200	386	221
		1201-1600	448	427
E	Esperanza/Kyuquot	501-800	427	324
		801-1200	355	290
		1201-1600	259	252
F	Cape Cook/Winter Harbour	501-800	201	79
		801-1200	540	367
		1201-1600	571	523
G	Quatsino	501-800	130	130
		801-1200	215	215
		1201-1600	307	307
	Total		**8,383**	**7,230**

Table 2. Biological sampling targets for selected fish species. Specimen sampling designations include LS (length by sex), LWSMO (length/weight/sex/maturity/otoliths) and LSM (length/sex/maturity).

Species	Specimen sampling (every tow)	Otolith sampling	Target number of otoliths	Random age sample
Longspine thornyhead	LS, LWSMO	Length stratified	1000	1 tow
Shortspine thornyhead	LS, LWSMO	Length stratified	600*	1 tow
Shortraker rockfish	LWSMO	Every fish*	200	No
Rougheye rockfish	LWSMO	Every fish*	200	No
Dover sole	LS, LWSMO	Length stratified	500	1 tow
Deepwater sole	LSM	No	N/A	No
Turbot	LS, LWSMO	Every fish*	200	No
Sablefish	LS, LWSMO	Length stratified*	500*	No
Roughscale rattail	LS	No	N/A	No
Pectoral rattail	LS	No	N/A	No
Sharks or skates	LS	No	N/A	No

* indicates a change from the 2001 survey protocol

Table 3. Summary of stratum, time, distance, speed and depth information for completed tows that were used for biomass estimation. The random sequence number refers to the order in which potential trawl sites were selected within each region/depth combination. Distance, speed and depth estimates are based on winch times.

Tow #	Region	Depth Zone (m)	Date	Winch lockup to retrieval (hr:min)	Bottom contact time (hr:min)	Random sequence number	Est. Distance traveled (km)	Est. Average speed (km/h)	Start Depth (m)	Finish Depth (m)
1	A	501-800	07-Sep-02	0:59	0:47	2	4.32	4.39	647	836
10	A	501-800	08-Sep-02	1:21	1:21	6	5.88	4.34	732	732
11	A	501-800	08-Sep-02	1:03	1:09	4	4.81	4.62	695	700
12	A	501-800	09-Sep-02	1:07	1:09	1	5.58	4.98	726	699
5	A	801-1200	07-Sep-02	1:30	–	6	6.56	4.36	1,052	1,070
6	A	801-1200	07-Sep-02	1:23	1:11	7	6.33	4.51	967	1,101
8	A	801-1200	08-Sep-02	1:07	0:56	3	5.31	4.78	1,097	1,152
9	A	801-1200	08-Sep-02	1:11	1:18	1	5.43	4.60	878	805
4	A	1201-1600	07-Sep-02	1:00	0:52	3	4.66	4.57	1,372	–
7	A	1201-1600	08-Sep-02	1:13	0:50	1	5.59	4.69	1,463	1,423
14	B	501-800	09-Sep-02	1:10	0:57	1	6.25	5.43	622	–
15	B	501-800	09-Sep-02	1:17	1:22	2	6.74	5.32	728	691
17	B	501-800	10-Sep-02	1:08	1:05	5	5.07	4.42	558	635
22	B	501-800	11-Sep-02	1:56	1:49	6	9.50	4.90	684	768
13	B	801-1200	09-Sep-02	1:02	0:60	4	4.70	4.47	885	914
18	B	801-1200	10-Sep-02	1:05	0:51	2	4.78	4.44	969	1,000
21	B	801-1200	10-Sep-02	1:31	1:18	6	6.54	4.32	951	905
23	B	801-1200	11-Sep-02	1:20	–	7	5.60	4.20	1,079	1,094
20	B	1201-1600	10-Sep-02	1:32	1:15	4	6.70	4.23	1,390	1,317
24	B	1201-1600	11-Sep-02	1:10	1:05	3	4.60	3.97	1,417	1,436
27	C	501-800	12-Sep-02	1:32	1:30	4	8.69	5.67	622	640
32	C	501-800	13-Sep-02	1:36	1:03	1	9.05	5.70	561	594
34	C	501-800	13-Sep-02	1:21	1:20	3	6.34	4.70	732	732
35	C	501-800	13-Sep-02	1:12	1:05	2	5.10	4.25	658	640
28	C	801-1200	12-Sep-02	1:22	1:06	2	5.93	4.35	951	924
29	C	801-1200	12-Sep-02	1:29	1:14	1	6.79	4.56	1,116	1,097
30	C	801-1200	12-Sep-02	1:21	–	3	5.51	4.09	1,161	1,024
33	C	801-1200	13-Sep-02	1:29	1:09	4	6.86	4.60	989	1,101
26	C	1201-1600	11-Sep-02	1:12	0:55	2	4.98	4.16	1,399	1,390
31	C	1201-1600	12-Sep-02	1:27	1:18	3	6.56	4.33	1,426	1,317
38	D	501-800	14-Sep-02	1:20	1:05	4	6.25	4.68	605	618
39	D	501-800	14-Sep-02	1:12	1:07	2	5.42	4.46	585	768
44	D	501-800	15-Sep-02	1:38	1:40	1	7.54	4.63	695	622
46	D	501-800	16-Sep-02	1:14	1:18	5	5.74	4.68	618	567
36	D	801-1200	13-Sep-02	1:44	1:32	2	7.47	4.25	1,006	951
37	D	801-1200	14-Sep-02	2:16	2:03	4	9.57	4.21	1,061	988
42	D	801-1200	15-Sep-02	1:22	1:23	1	5.66	4.14	951	951
43	D	801-1200	15-Sep-02	1:25	1:24	3	6.24	4.45	988	960
45	D	801-1200	16-Sep-02	1:37	1:42	5	6.94	4.27	1,134	1,170
40	D	1201-1600	14-Sep-02	1:24	1:16	1	6.14	4.30	1,286	1,280
41	D	1201-1600	15-Sep-02	1:27	1:14	3	6.06	4.17	1,289	1,454

(continued)

Table 3. (continued).

Tow #	Region	Depth Zone (m)	Date	Winch lockup to retrieval (hr:min)	Bottom contact time (hr:min)	Random sequence number	Est. Distance traveled (km)	Est. Average speed (km/h)	Start Depth (m)	Finish Depth (m)
47	E	501-800	16-Sep-02	1:36	1:20	4	7.60	4.66	582	558
48	E	501-800	16-Sep-02	1:18	1:17	3	5.70	4.37	622	768
54	E	501-800	18-Sep-02	0:44	0:42	6	3.44	4.69	549	585
55	E	501-800	18-Sep-02	0:50	0:48	5	3.59	4.31	585	704
49	E	801-1200	16-Sep-02	1:25	1:05	2	6.07	4.44	878	878
50	E	801-1200	17-Sep-02	1:42	1:39	3	7.50	4.41	997	969
52	E	801-1200	17-Sep-02	0:56	0:58	5	4.20	4.53	841	951
53	E	801-1200	17-Sep-02	1:06	1:12	6	5.10	4.67	841	889
51	E	1201-1600	17-Sep-02	1:09	0:42	10	4.90	4.20	1,317	1,445
63	E	1201-1600	21-Sep-02	1:17	–	19	5.41	4.20	1,353	1,189
56	F	501-800	18-Sep-02	0:54	0:47	3	4.51	5.11	519	549
64	F	501-800	21-Sep-02	0:57	0:58	14	5.11	5.26	530	567
65	F	501-800	21-Sep-02	0:55	0:46	13	4.35	4.69	567	622
66	F	501-800	21-Sep-02	0:53	0:52	9	4.25	4.82	512	521
58	F	801-1200	20-Sep-02	1:16	–	6	5.54	4.42	1,061	1,134
59	F	801-1200	20-Sep-02	1:12	1:03	5	5.62	4.67	841	1,061
60	F	801-1200	20-Sep-02	1:00	1:01	9	5.07	5.03	878	1,006
61	F	801-1200	20-Sep-02	1:08	0:59	14	5.69	5.05	951	1,024
67	F	1201-1600	21-Sep-02	0:33	0:33	3	2.67	4.76	1,399	1,426
68	F	1201-1600	21-Sep-02	1:15	1:13	5	5.32	4.34	1,308	1,289
73	G	501-800	22-Sep-02	0:43	0:42	21	4.02	5.62	585	768
74	G	501-800	23-Sep-02	1:05	1:01	5	4.99	4.61	622	1,006
70	G	801-1200	22-Sep-02	1:04	1:04	25	5.00	4.68	1,070	1,170
72	G	801-1200	22-Sep-02	1:05	0:46	5	5.05	4.71	933	1,189
69	G	1201-1600	22-Sep-02	1:01	0:57	5	4.54	4.47	1,280	1,262
71	G	1201-1600	22-Sep-02	1:05	0:55	14	4.90	4.50	1,317	1,298

Table 4. Tows that were attempted and excluded from analyses and the reasons why.

Tow	Area	Depth Zone	Date of tow	Reason for excluding tow
2	A	501-800 m	07-Sep-02	Net snagged on bottom
3	A	1201-1600 m	07-Sep-02	Net snagged on bottom
16	B	801-1200 m	09-Sep-02	Doors crossed
19	B	1201-1600 m	10-Sep-02	Doors crossed
25	C	1201-1600 m	11-Sep-02	Tide too strong to position properly for tow
57	F	801-1200 m	18-Sep-02	Large swell – not enough bottom contact time
62	F	1201-1600 m	20-Sep-02	Door twisted on port side – no Scanmar readings

Table 5. Summary of predetermined stations that were rejected as the survey progressed. Stations were rejected at the skipper's discretion, with no recorded reason supplied for 'skipped' stations. Three stations were rejected due to gear problems.

			Rejected random stations				
Area	Name	Depth Zone (m)	Total	Did not meet survey criteria	Bad bottom terrain	Gear problems	Skipped
A	Barkley	501-800	2	1	0	1	0
		801-1200	3	3	0	0	0
		1201-1600	1	0	0	1	0
B	Loudon/Clayoquot	501-800	2	2	0	0	0
		801-1200	3	3	0	0	0
		1201-1600	2	1	1	0	0
C	Clayoquot/Estevan	1201-1600	1	0	1	0	0
D	Nootka/500	501-800	1	1	0	0	0
		1201-1600	1	1	0	0	0
E	Esperanza/Kyuquot	501-800	2	2	0	0	0
		801-1200	2	1	1	0	0
		1201-1600	17	6	9	0	2
F	Cape Cook/Winter Harbour	501-800	10	3	7	0	0
		801-1200	10	0	1	1	8
		1201-1600	3	0	0	0	3
G	Quatsino	501-800	19	0	0	0	19
		801-1200	23	1	2	0	20
		1201-1600	12	1	1	0	10
	Total rejected tows		**114**	**26**	**23**	**3**	**62**

Table 6. Summary statistics for net and vessel characteristics by depth stratum and for the total survey. Only valid biomass tows are included.

	Mean	Standard Deviation	Minimum	Maximum	N
Doorspread (m)					
501-800m	57.2	2.4	50.2	61.1	26
801-1200m	56.3	2.3	51.3	60.2	27
1201-1600m	55.1	5.1	39.8	58.6	14
Total	**56.4**	**3.1**	**39.8**	**61.1**	**67**
Wingspread (m)					
501-800m	17.1	0.5	15.7	18.0	26
801-1200m	16.9	0.4	15.6	17.6	27
1201-1600m	16.6	1.0	13.7	17.3	14
Total	**16.9**	**0.6**	**13.7**	**18.0**	**67**
Headline height (m)					
501-800m	4.1	0.6	3.5	6.2	26
801-1200m	4.0	0.4	3.2	5.2	27
1201-1600m	3.8	0.6	2.0	4.7	14
Total	**4.0**	**0.5**	**2.0**	**6.2**	**67**
Vessel speed (km/h)					
501-800m	4.8	0.4	4.2	5.7	26
801-1200m	4.5	0.2	4.1	5.1	27
1201-1600m	4.4	0.2	4.0	4.8	14
Total	**4.6**	**0.4**	**4.0**	**5.7**	**67**
Distance traveled (km)					
501-800m	5.8	1.6	3.4	9.5	26
801-1200m	6.0	1.1	4.2	9.5	27
1201-1600m	5.2	1.0	2.7	6.8	14
Total	**5.7**	**1.3**	**2.7**	**9.5**	**67**

Table 7. Time delay statistics by depth stratum from: 1) winch lockup to net arrival on bottom and 2) net retrieval to net liftoff from bottom. Statistics are calculated for valid tows only using bottom contact sensor data.

Depth stratum	Mean	Standard Deviation	Minimum	Maximum	N
Winch lockup to bottom contact (minutes)					
501-800m	6.3	4.9	-1.2	22.2	26
801-1200m	10.9	6.4	-1.5	20.2	23
1201-1600m	16.6	4.8	8.7	24.2	13
Total	**10.1**	**6.7**	**-1.5**	**24.2**	**62**
Net retrieval to liftoff from bottom (minutes)					
501-800m	1.5	4.5	-10.7	12.0	26
801-1200m	3.5	4.8	-11.9	11.8	23
1201-1600m	5.5	6.6	-12.7	13.9	13
Total	**3.1**	**5.2**	**-12.7**	**13.9**	**62**

Table 8. Valid survey tows with no usable bottom contact trace data and values used for the ratio $\left(H_q/E_q\right)$ in Eq. 5 (ratio of bottom contact time to tow duration: see caption in Figure 5 for a description of these values).

Tow	Area	Depth zone	Ratio: $\left(H_q/E_q\right)$
5	A	801-1200m	0.913
23	B	801-1200m	0.913
30	C	801-1200m	0.913
58	F	801-1200m	0.913
63	E	1201-1600m	0.852

Table 9. Listing of species or higher taxonomic groups that were captured during the 2002 survey. Species catches are listed in descending order. GFBio species codes are provided for reference, along with the number of valid tows.

Species/Group	Scientific Name	Code	Catch weight (kg)	Valid tows	% of valid tows	% of total catch	Cumulative % of total catch
Roughscale rattail	*Coryphaenoides acrolepis*	251	5,371.9	59	88.1	18.1	18.1
Longspine thornyhead	*Sebastolobus altivelis*	453	5,241.3	67	100.0	17.6	35.7
Sablefish	*Anoplopoma fimbria*	455	5,041.3	62	92.5	17.0	52.7
Shortspine thornyhead	*Sebastolobus alascanus*	451	3,429.3	63	94.0	11.5	64.2
Pectoral rattail	*Albatrossia pectoralis*	256	2,598.4	61	91.0	8.7	72.9
Dover sole	*Microstomus pacificus*	626	2,404.5	46	68.7	8.1	81.0
Shortraker rockfish	*Sebastes borealis*	403	724.5	15	22.4	2.4	83.5
Brittle stars	Ophiuroidea Ophiurae	5AA 5AB	595.4	17	25.4	2.0	85.5
Pacific flatnose	*Antimora microlepis*	220	539.0	61	91.0	1.8	87.3
Sea urchins	Echinacea	6AB	478.8	7	10.4	1.6	88.9
Tanner crabs	*Chionoecetes* sp.	ZAD	400.7	59	88.1	1.3	90.2
Squids	Teuthoidea *Berryteuthis magister*	95E 92A	359.1	53	79.1	1.2	91.4
Arrowtooth flounder	*Atheresthes stomias*	602	285.0	9	13.4	1.0	92.4
Abyssal skate	*Bathyraja abyssicola*	054	262.7	12	17.9	0.9	93.3
Longnose skate	*Raja rhina*	059	226.3	17	25.4	0.8	94.0
Deepsea sole	*Embassichthys bathybius*	605	197.2	51	76.1	0.7	94.7
Atlantic salmon	*Salmo salar*	131	171.0	2	3.0	0.6	95.3
Roughtail skate	*Bathyraja trachura*	057	159.6	28	41.8	0.5	95.8
Filamented rattail	*Coryphaenoides filifer*	254	109.4	30	44.8	0.4	96.2
Twoline eelpout	*Bothrocara brunneum*	235	108.7	41	61.2	0.4	96.6
Slickheads	*Alepocephalidae*	642	107.4	26	38.8	0.4	96.9
Anemone	*Actiniaria* sp.	3L0	92.9	39	58.2	0.3	97.2
Sea whip	*Osteocella septentrionalis*	3U2	81.5	19	28.4	0.3	97.5
Pacific hake	*Merluccius productus*	225	69.5	11	16.4	0.2	97.7
Rex sole	*Errex zachirus*	610	64.1	12	17.9	0.2	98.0
Starfish	Asteriodea	4GA	52.0	40	59.7	0.2	98.1
Sponges	Porifera	2A0	50.4	16	23.9	0.2	98.3
Echinoidea	Echinoidea	6AA	48.0	5	7.5	0.2	98.5
Unidentified organic matter	Unknown	849	44.6	21	31.3	0.2	98.6
Inanimate object(s)	Inanimate object(s)	004	42.2	21	31.3	0.1	98.8

(continued)

Table 9. (Continued)

Species/Group	Scientific Name	Code	Catch weight (kg)	Valid tows	% of valid tows	% of total catch	Cumulative % of total catch
Blob sculpin	*Psychrolutes phrictus*	534	39.2	4	6.0	0.1	98.9
Benthoctopus	*Benthoctopus* sp.	99A	30.0	13	19.4	0.1	99.0
Rougheye rockfish	*Sebastes aleutianus*	394	28.4	7	10.4	0.1	99.1
Black eelpout	*Lycodes diapterus*	243	27.5	39	58.2	0.1	99.2
Brown cat shark	*Apristurus brunneus*	038	26.2	26	38.8	0.1	99.3
Sandpaper skate	*Bathyraja interrupta*	058	25.6	10	14.9	0.1	99.3
Sea cucumber	Holothuroidea	6NA	19.4	10	14.9	0.1	99.4
Glass sponges	Hexactinellida	2I0	16.2	11	16.4	0.1	99.5
Cirrata	Cirrata	97B	13.1	14	20.9	0.0	99.5
Aurora rockfish	*Sebastes aurora*	400	12.5	7	10.4	0.0	99.6
Blacktail snailfish	*Careproctus melanurus*	574	11.9	17	25.4	0.0	99.6
Spiny red sea star	*Hippasteria spinosa*	4JF	10.1	20	29.9	0.0	99.6
Northern lampfish	*Stenobrachius leucopsarus*	198	8.7	47	70.1	0.0	99.7
Deepsea smelts	Bathylagidae	152	8.1	32	47.8	0.0	99.7
Sand star	*Luidia foliolata*	4GD	7.7	14	20.9	0.0	99.7
Lithodes couesi	*Lithodes couesi*	VMD	7.5	10	14.9	0.0	99.7
Primnoa	*Primnoa* sp.	3T0	6.5	1	1.5	0.0	99.8
Coeclenterates	Cnidaria	3A1	6.3	9	13.4	0.0	99.8
Paralomis multispina	*Paralomis multispina*	VOG	5.5	4	6.0	0.0	99.8
Lumpfishes and snailfishes	Cyclopteridae	568	4.6	8	11.9	0.0	99.8
Octopus	*Octopus* sp.	98D	3.9	7	10.4	0.0	99.8
Pacific viperfish	*Chauliodus macouni*	171	3.8	30	44.8	0.0	99.8
Vampire squid	*Vampyroteuthis infernalis*	96G	3.6	1	1.5	0.0	99.9
Gastropods	Gastropoda	10A	3.5	21	31.3	0.0	99.9
Longfin dragonfish	*Tactostoma macropus*	167	3.0	16	23.9	0.0	99.9
Jellyfish	Scyphozoa	3G0	3.0	23	34.3	0.0	99.9
Pacific hagfish	*Eptatretus stouti*	018	2.9	5	7.5	0.0	99.9
Robust clubhook squid	*Moroteuthis robusta*	96C	2.4	1	1.5	0.0	99.9
Red king crab	*Paralithodes cammtschatica*	VNH	2.3	7	10.4	0.0	99.9
Acanthonychinae	Acanthonychinae	ZDA	2.0	1	1.5	0.0	99.9
Prawn	*Pandalus platyceros*	SDF	1.7	10	14.9	0.0	99.9
Spotted ratfish	*Hydrolagus colliei*	066	1.7	1	1.5	0.0	99.9
True crabs	*Bracyura* sp.	WAA	1.5	1	1.5	0.0	99.9
Fish eggs	Unknown	001	1.4	9	13.4	0.0	99.9
Seaslugs	Nudibranchiata	51A	1.3	4	6.0	0.0	99.9
Paragorgia pacifica	*Paragorgia pacifica*	3S7	1.1	1	1.5	0.0	99.9
Crested ridgehead	*Poromitra crassiceps*	264	1.1	11	16.4	0.0	99.9
Bivalve molluscs	Bivalvia	60A	1.0	1	1.5	0.0	100.0
Scaly sea cucumber	*Psolus squamatus*	6QD	1.0	5	9.0	0.0	100.0
Gorgonian corals	Gorgonacea	3S0	1.0	6	7.5	0.0	100.0
Alaskan king crabs	*Paralithodes* sp.	VNF	0.9	1	1.5	0.0	100.0
Blackfin poacher	*Bathyagonus nigripinnis*	557	0.9	4	6.0	0.0	100.0
Dreamers	Oneirodidae	213	0.8	2	3.0	0.0	100.0
Poachers	Agonidae	546	0.8	7	10.4	0.0	100.0
Heart urchins	*Atelostomata* sp.	6KA	0.7	6	9.0	0.0	100.0
Slender sole	*Eopsetta exilis*	625	0.6	2	3.0	0.0	100.0
Sand lances	*Ammodytidae*	360	0.6	7	10.4	0.0	100.0
Unknown fish	Unknown fish	015	0.6	1	1.5	0.0	100.0
Shrimp	*Nantantia* sp.	SAB	0.6	6	9.0	0.0	100.0

(continued)

Table 9. (Continued).

Species/Group	Scientific Name	Code	Catch weight (kg)	Valid tows	% of valid tows	% of total catch	Cumulative % of total catch
Graveldiver	*Scytalina cerdale*	357	0.5	1	1.5	0.0	100.0
Aeolidiidae	Aeolidiidae	56B	0.5	1	1.5	0.0	100.0
Threadfin slickhead	*Talismania bifurcata*	643	0.5	1	1.5	0.0	100.0
Manacled sculpin	*Synchirus gilli*	542	0.5	1	1.5	0.0	100.0
Allocoels	Allocoels	4G0	0.4	2	3.0	0.0	100.0
Snipe eels	Nemichthyidae	087	0.3	3	4.5	0.0	100.0
Tube worms	*Sedentaria* sp.	0FA	0.3	2	3.0	0.0	100.0
Squat lobster	*Munida quadrispina*	VSA	0.3	3	4.5	0.0	100.0
Polychaete worms	Polychaeta	0AB	0.3	3	4.5	0.0	100.0
Slender blacksmelt	*Bathylagus pacificus*	155	0.3	3	4.5	0.0	100.0
Lanternfishes	Myctophidae	185	0.2	2	3.0	0.0	100.0
Slender barracudina	*Lestidiops ringens*	181	0.2	2	3.0	0.0	100.0
Redbanded rockfish	*Sebastes babcocki*	401	0.2	1	1.5	0.0	100.0
Smelts	Osmeridae	136	0.1	1	1.5	0.0	100.0
Sauries	Scomberesocidae	258	0.1	1	1.5	0.0	100.0
Kelp crab	*Pugettia producta*	ZDF	0.1	1	1.5	0.0	100.0
Stout blacksmelt	*Bathylagus milleri*	153	0.1	1	1.5	0.0	100.0
Pedunculate barnacles	*Lepadomorpha*	HCC	0.1	1	1.5	0.0	100.0
Invertebrates	Invertebrates	0A0	0.1	1	1.5	0.0	100.0
Pacific bobtail squid	*Rossia pacifica*	91G	0.1	1	1.5	0.0	100.0
Hermit crabs	Paguridae	VAC	0.1	1	1.5	0.0	100.0
Rockweed gunnel	*Apodichthys fucorum*	350	0.1	1	1.5	0.0	100.0
Total			**29,726.9**	**67**			

Table 10. Numbers of samples collected and specimens sampled for biological attributes.

Species	Samples	Length	Weight	Sex	Maturity	Otoliths
Longspine thornyhead	62	6,952	1,333	6,955	5,734	1,333
Roughscale rattail	43	4,890	88	4,890	88	88
Shortspine thornyhead	61	3,078	786	3,078	3,071	786
Dover sole	40	1,943	492	1,943	1,896	492
Sablefish	57	1,435	478	1,435	1,407	470
Pectoral rattail	41	1,326	29	1,320	29	29
Deepsea sole	43	293	71	293	265	71
Shortraker rockfish	15	211	211	211	211	211
Roughtail skate	27	79	0	79	0	0
Brown cat shark	23	70	0	69	0	0
Arrowtooth flounder	7	60	60	60	60	60
Longnose skate	16	35	0	35	0	0
Rex sole	1	31	0	31	31	0
Abyssal skate	9	21	0	21	0	0
Rougheye rockfish	7	17	17	17	17	17
Sandpaper skate	3	4	0	4	0	0
Aurora rockfish	1	1	1	1	1	1
TOTAL	**456**	**20,446**	**3,566**	**20,442**	**12,810**	**3,558**

Table 11. Summary of the number of samples with target species catches and no length information by stratum. See Appendix D to identify which particular tows lack length data.

Species	Regional Stratum	Depth Stratum			
		501-800 m	801-1200 m	1201-1600 m	Total
Dover sole	C	0	0	1	1
	D	0	2	0	2
	E	0	0	1	1
	F	1	1	0	2
	All	**1**	**3**	**2**	**6**
Longspine thornyhead	C	0	0	2	2
	D	1	1	0	2
	F	0	0	1	1
	All	**1**	**1**	**3**	**5**
Pectoral rattail	A	1	0	0	1
	B	1	0	0	1
	D	3	2	0	5
	E	2	3	0	5
	F	3	3	1	7
	G	1	1	0	2
	All	**11**	**9**	**1**	**21**
Roughscale rattail	A	2	0	0	2
	B	1	0	0	1
	D	1	3	0	4
	E	1	1	0	2
	F	1	2	1	4
	G	1	0	0	1
	All	**7**	**6**	**1**	**14**
Sablefish	C	0	0	1	1
	D	0	1	1	2
	E	0	0	1	1
	All	**0**	**1**	**3**	**4**
Shortspine thornyhead	C	0	0	1	1
	D	0	1	0	1
	F	0	0	1	1
	G	0	1	0	1
	All	**0**	**2**	**2**	**4**
Grand Total		**20**	**22**	**12**	**54**

Table 12. Summary of longspine thornyhead specimens having otoliths collected based on LWSMO sampling targets provided in Table 2. Length bins include lengths ≤ bin value. Specimens were sexed if possible, or recorded as 'Unkn' for unknown sex. Shaded intervals include all specimens ≤ minimum bin length, or greater than the maximum bin length for each species.

Length Bin (cm)	Longspine Thornyhead			
	Male	Female	Unkn	Total
10	0	1	62	63
11	0	2	33	35
12	3	1	51	55
13	0	1	54	55
14	8	4	54	66
15	24	20	46	90
16	30	26	23	79
17	33	35	10	78
18	22	26	5	53
19	28	27	8	63
20	26	24	0	50
21	37	31	0	68
22	37	35	0	72
23	32	31	0	63
24	36	39	0	75
25	31	45	0	76
26	33	53	0	86
27	28	38	0	66
28	35	28	0	63
29	35	42	0	77
Total	**478**	**509**	**346**	**1,333**

Table 13. Summary of specimens having otoliths collected based on the LWSMO sampling targets provided in Table 2. Length bins include lengths ≤ bin value. Specimens were sexed if possible, or recorded as 'Unkn' for unknown sex. Shaded intervals include all specimens ≤ minimum bin length, or greater than the maximum bin length for each species.

Length Bin	Shortspine Thornyhead				Sablefish			Dover sole		
(cm)	Male	Female	Unkn	Total	Male	Female	Total	Male	Female	Total
21	23	18	1	42						
23	21	13	0	34						
25	17	15	0	32						
27	16	18	0	34						
29	19	20	0	39						
31	16	15	0	31				4	0	4
33	15	17	0	32				20	0	20
35	27	13	0	40				26	2	28
37	30	15	0	45				31	1	32
39	30	27	0	57				33	14	47
41	18	26	0	44				31	9	40
43	15	23	0	38				22	22	44
45	14	23	0	37				21	30	51
47	18	23	0	41				25	27	52
49	15	16	0	31	14	1	15	22	30	52
51	16	22	0	38	25	1	26	22	40	62
53	7	13	0	20	17	2	19	7	21	28
55	10	25	0	35	23	7	30	2	30	32
57	12	15	0	27	25	9	34			
59	6	19	0	25	20	15	35			
61	9	55	0	64	14	17	31			
63					19	16	35			
65					25	15	40			
67					23	16	39			
69					18	18	36			
71					6	17	23			
73					5	7	12			
75					5	20	25			
77					1	19	20			
79					0	21	21			
81					0	8	8			
83					0	21	21			
Total	**354**	**431**	**1**	**786**	**240**	**230**	**470**	**266**	**226**	**492**

Table 14. Summary of length statistics by depth stratum for selected species from tows accepted for biomass estimation.

Species	Depth (m)	Length (mm)				
		Mean	SD	Min	Max	N
Shortspine thornyhead	501-800	338.1	82.0	102	779	4,021
	801-1200	403.9	74.7	200	887	1,315
	1201-1600	386.3	87.4	190	799	138
Longspine thornyhead	501-800	209.2	47.6	66	330	4,592
	801-1200	202.2	48.5	10	623	7,451
	1201-1600	222.6	43.0	80	326	1,499
Sablefish	501-800	587.7	73.6	104	955	2,267
	801-1200	599.9	72.1	340	900	1,245
	1201-1600	689.8	71.89	510	800	40
Deepsea sole	501-800	378.7	44.1	292	499	63
	801-1200	328.9	51.1	160	530	318
	1201-1600	370.6	119.4	109	1,360	85
Dover sole	501-800	418.6	49.1	221	631	2,746
	801-1200	440.1	42.0	320	560	396
	1201-1600	395.0	95.1	37	505	25

Table 15. Two alternative biomass estimates, associated standard errors and *REs* from the 2002 longspine survey for the top 12 species and deepsea sole. One set of CPUE estimates is based on total bottom contact time (Eq. 5) while the other CPUE estimates used the effort component derived from winch lockup to retrieval times (Eq. 4). Two species codes for squid (92A and 95E) and brittle stars (5AA and 5AB) were combined prior to preparing this table.

Species	CPUE based on bottom contact time			CPUE based on winch lockup to retrieval time		
	Biomass (t)	Standard Error (t)	*RE* (%)	Biomass (t)	Standard Error (t)	*RE* (%)
Sablefish	4,347.3	688.6	15.8	3,979.1	666.8	16.8
Roughscale rattail	9,503.8	1,117.5	11.8	8,172.4	1,048.0	12.8
Longspine thornyhead	4,875.2	463.3	9.5	4,442.6	431.1	9.7
Shortspine thornyhead	2,606.9	183.9	7.1	2,420.5	171.5	7.1
Pectoral rattail	5,790.5	804.3	13.9	4,937.6	750.6	15.2
Dover sole	1,814.5	316.8	17.5	1,659.4	289.0	17.4
Pacific flatnose	1,264.0	171.5	13.6	1,068.2	165.6	15.5
Tanner crabs	409.3	56.4	13.8	369.9	51.5	13.9
Shortraker rockfish	380.3	93.8	24.7	356.3	88.4	24.8
Brittle stars	1,693.7	734.8	43.4	1,502.5	673.4	44.8
Longnose skate	166.9	57.3	34.3	156.4	55.3	35.4
Squids	243.7	37.7	15.5	225.7	37.1	16.4
Deepsea sole	339.0	119.5	35.3	305.8	107.1	35.0

Table 16. Relative biomass estimates (tonnes) by depth zone and area strata for selected species based on CPUE using bottom contact sensor times and actual wingspread measurements. Estimates are biomass (B), standard error (SE) and relative error (RE). Area and depth strata are described in Table 1 and shown in Figure 1. Sablefish have no biomass or standard error estimates in the deep zone for Region F since no sablefish were caught in that stratum.

	Depth zone strata											
	501-800 m			801-1200 m			1201-1600 m			Total		
Area stratum	B (t)	SE (t)	*RE* (%)	B (t)	SE (t)	*RE* (%)	B (t)	SE (t)	*RE* (%)	B (t)	SE (t)	*RE* (%)
Longspine thornyhead												
A	109.0	25.8	23.7	376.7	39.5	10.5	152.4	147.2	96.6	638.2	154.6	24.2
B	95.1	29.9	31.5	432.7	82.2	19.0	107.9	28.8	26.7	635.7	92.1	14.5
C	39.0	13.7	35.2	361.6	80.3	22.2	20.4	5.7	27.8	421.0	81.6	19.4
D	36.4	22.2	61.0	530.9	87.5	16.5	95.2	58.2	61.2	662.5	107.4	16.2
E	59.5	9.2	15.4	468.2	89.4	19.1	65.3	31.8	48.7	593.0	95.3	16.1
F	23.8	8.1	34.0	1,044.6	343.8	32.9	179.6	173.2	96.5	1,248.0	385.1	30.9
G	137.2	19.8	14.5	451.6	74.2	16.4	88.1	27.4	31.2	676.9	81.6	12.1
Total	**500.1**	**52.8**	**10.6**	**3,666.3**	**392.6**	**10.7**	**708.8**	**240.2**	**33.9**	**4,875.2**	**463.3**	**9.5**
Shortspine thornyhead												
A	222.9	43.3	19.4	86.2	32.5	37.7	10.0	10.0	100.0	319.1	55.0	17.3
B	212.0	64.2	30.3	81.3	16.4	20.2	7.1	7.1	100.0	300.3	66.7	22.2
C	104.4	27.7	26.5	45.6	13.1	28.6	8.5	8.5	100.0	158.6	31.8	20.1
D	132.1	27.8	21.0	68.2	13.3	19.6	17.1	17.1	100.0	217.4	35.2	16.2
E	612.1	97.0	15.9	145.9	51.1	35.0	38.7	1.3	3.5	796.7	109.7	13.8
F	140.4	7.4	5.2	228.8	62.8	27.4	36.0	27.1	75.2	405.3	68.8	17.0
G	283.7	66.8	23.5	98.0	52.1	53.2	27.8	12.1	43.5	409.6	85.6	20.9
Total	**1,707.7**	**146.5**	**8.6**	**754.0**	**104.6**	**13.9**	**145.2**	**37.4**	**25.7**	**2,606.9**	**183.9**	**7.1**
Sablefish												
A	353.4	89.1	25.2	216.7	61.3	28.3	26.7	26.7	100.0	596.8	111.4	18.7
B	180.9	20.3	11.2	163.1	41.0	25.1	71.6	2.6	3.6	415.6	45.8	11.0
C	270.9	58.6	21.6	119.0	38.4	32.3	5.3	5.3	100.0	395.2	70.3	17.8
D	90.7	24.2	26.7	106.5	17.7	16.6	76.8	21.9	28.5	274.0	37.1	13.5
E	1,172.7	631.0	53.8	184.2	69.0	37.5	26.4	26.4	100.0	1,383.4	635.3	45.9
F	52.3	8.2	15.7	568.5	146.7	25.8	0.0	0.0		620.8	146.9	23.7
G	310.1	122.8	39.6	323.3	113.3	35.1	28.1	15.0	53.2	661.5	167.7	25.4
Total	**2,431.0**	**652.4**	**26.8**	**1,681.3**	**215.3**	**12.8**	**235.0**	**46.4**	**19.7**	**4,347.3**	**688.6**	**15.8**

Table 17. Comparison of 2001 and 2002 biomass estimates for thirteen species. Biomass estimates for both surveys are based on CPUE estimates calculated from winch lockup to retrieval time (Eq. 4) and use tows in areal strata A-F only (refer to Figure 1 for strata codes). A constant wingspread of 20 m is used for both surveys to estimate CPUE density. Two species codes for squid (92A and 95E) are combined as well as two brittle star codes (5AA and 5AB).

Species	Biomass (t)			Relative Error	
	2001	2002	Difference (%)	2001	2002
Roughscale rattail	6,431	5,915	-8%	11.6%	13.6%
Pectoral rattail	4,167	3,904	-6%	11.8%	15.2%
Sablefish	3,824	2,893	-24%	13.2%	20.0%
Longspine thornyhead	3,191	3,204	0%	9.5%	10.5%
Shortspine thornyhead	1,531	1,725	13%	7.8%	7.3%
Dover sole	845	1,068	26%	13.3%	21.6%
Pacific flatnose	824	776	-6%	12.2%	16.7%
Tanner crabs	538	299	-44%	18.3%	13.5%
Brittle stars	349	734	110%	89.6%	35.4%
Longnose skate	504	127	-75%	51.1%	35.9%
Squids	112	162	45%	24.0%	16.1%
Deepsea sole	104	221	113%	17.6%	34.5%
Shortraker rockfish	15	218	1353%	71.4%	24.4%

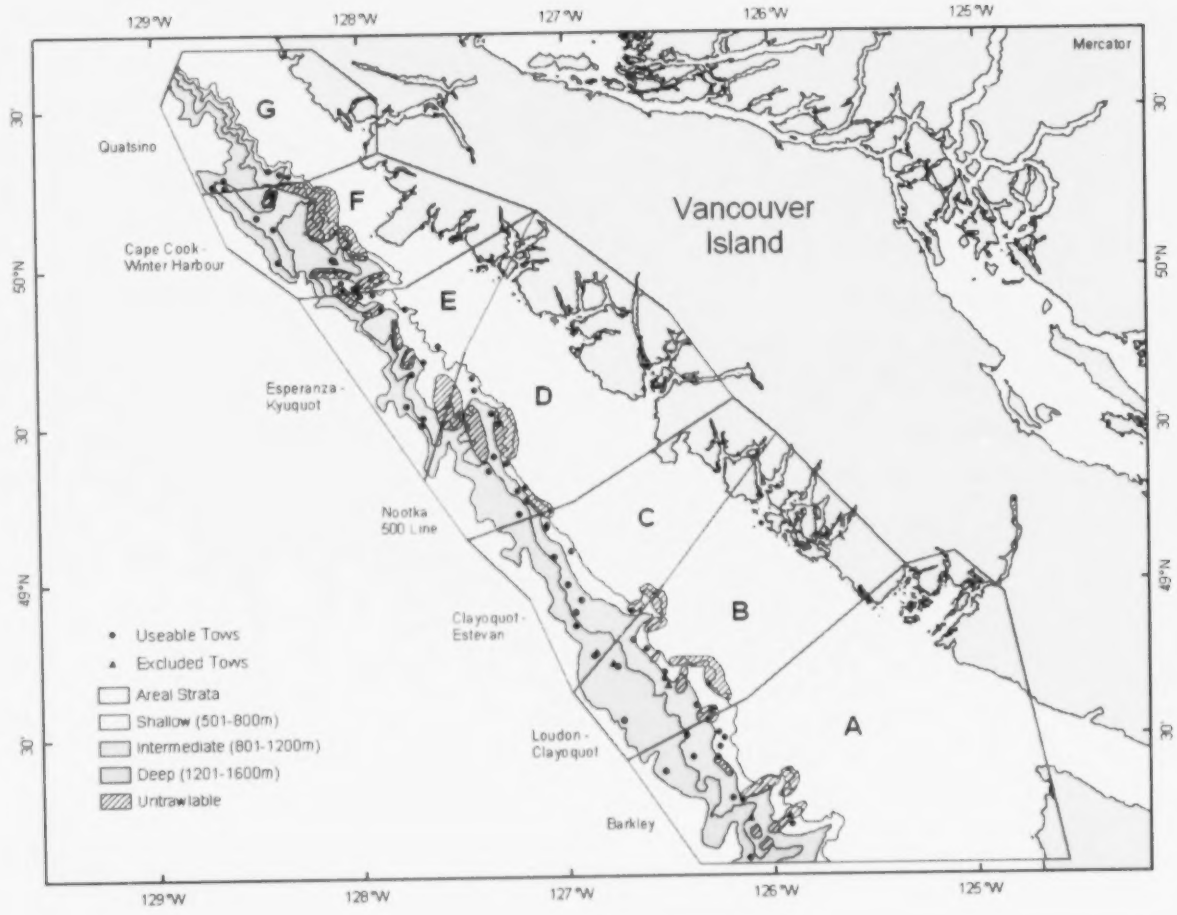

Figure 1. Coastal waters of Vancouver Island illustrating the 7 areal strata and 3 depth strata defined for the 2002 survey. Locations of usable and excluded tows are shown, along with areas considered untrawlable and excluded from site selection. See Table 1 for names of areal strata A-G and estimated surface areas within each stratum.

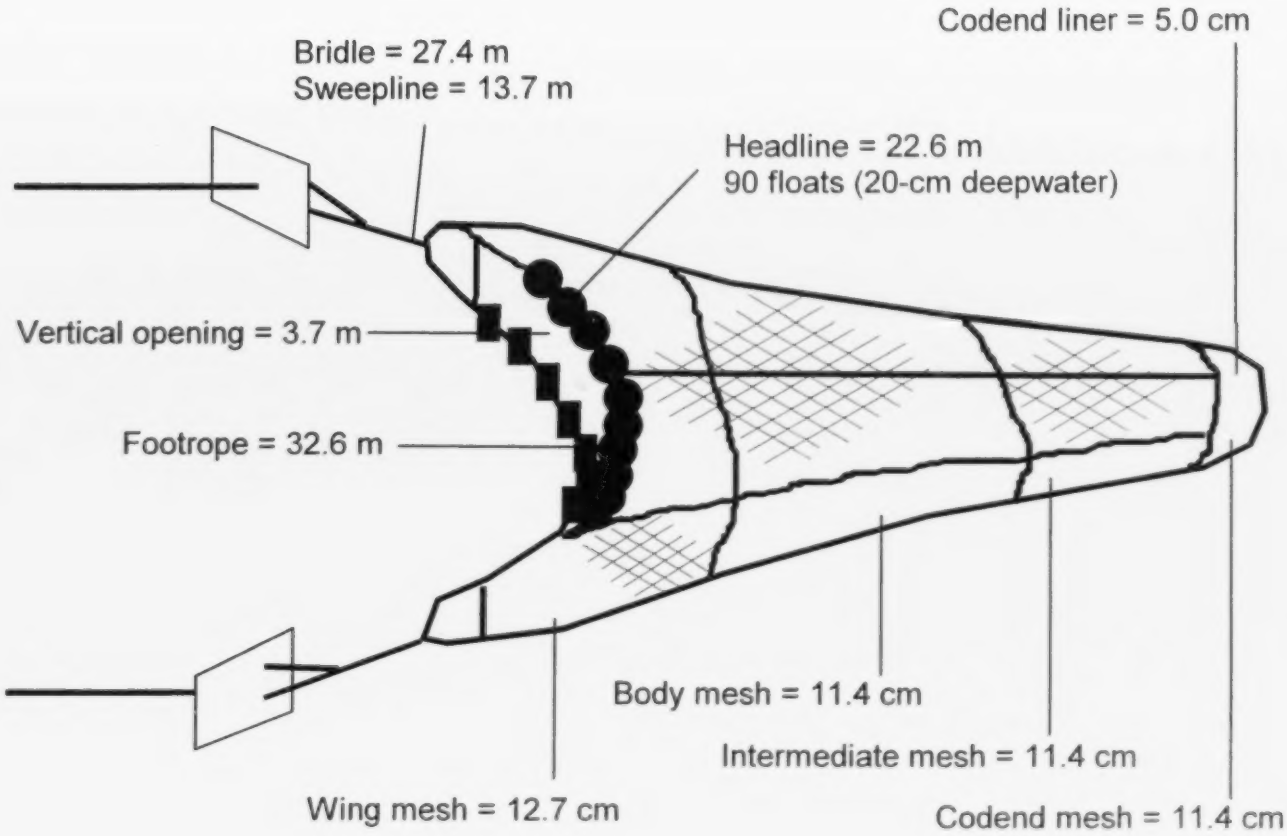
Codend liner = 5.0 cm
Bridle = 27.4 m
Sweepline = 13.7 m
Headline = 22.6 m
90 floats (20-cm deepwater)
Vertical opening = 3.7 m
Footrope = 32.6 m
Body mesh = 11.4 cm
Intermediate mesh = 11.4 cm
Wing mesh = 12.7 cm
Codend mesh = 11.4 cm

Figure 2. Selected net specifications for the 2002 Atlantic Western II box trawl. Differences exist between the net used in 2001 and 2002.

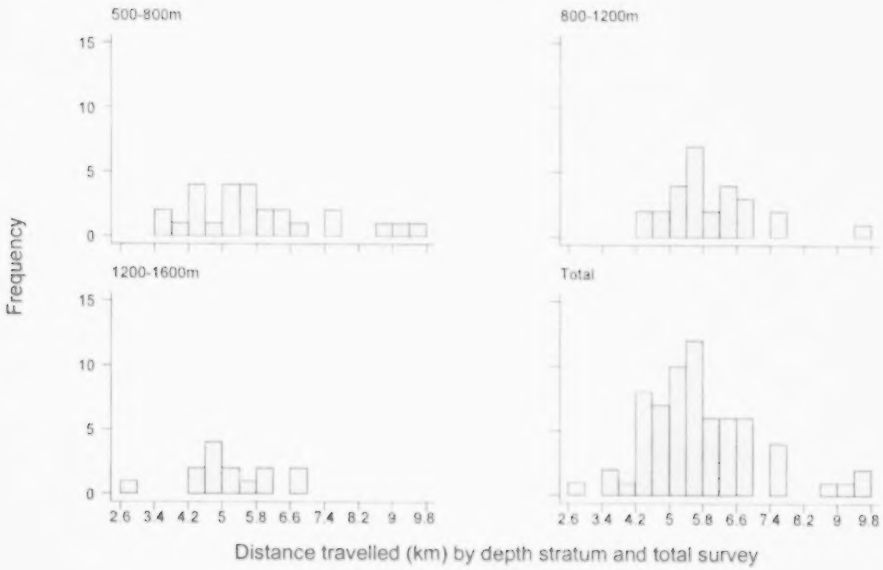

Figure 3. Frequency distributions by depth stratum for distance traveled (km) based on the 67 valid survey sets.

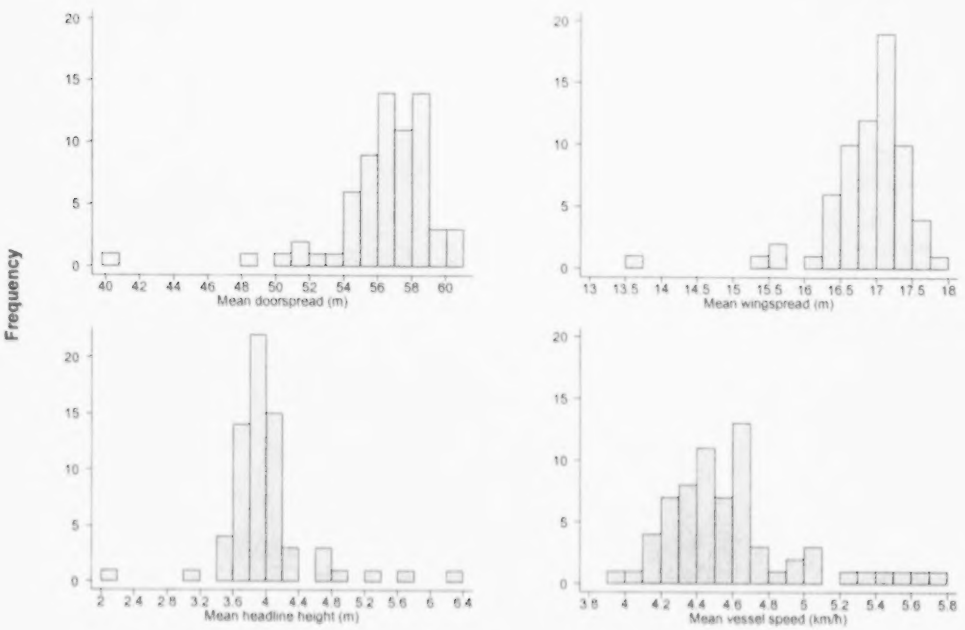

Figure 4. Frequency distributions of means from interval data for doorspread (m), wingspread (m); headline height (m) and average speed (km/h) for the 67 valid survey tows.

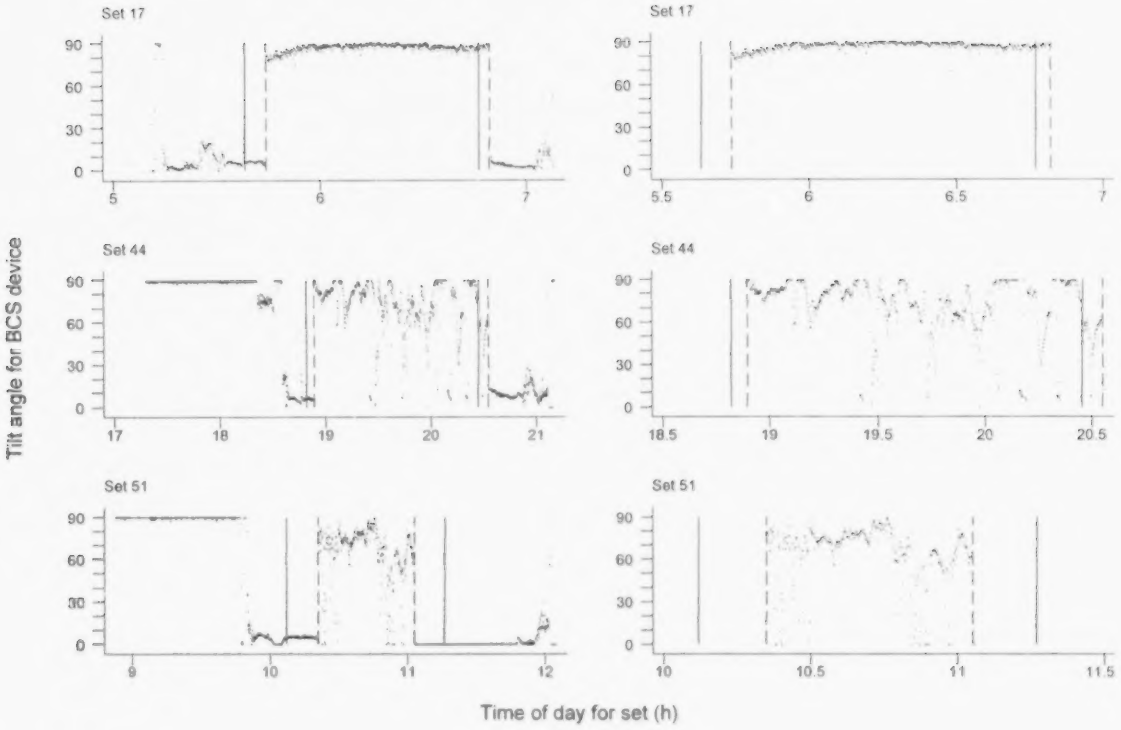

Figure 5. Plots of bottom contact sensor traces (tilt angle degrees) against elapsed tow time (hours) for three example tows from the 2002 survey (sets 17, 44 and 51). Winch lockup and net retrieval times for each tow are shown as solid vertical lines and estimated times that the net reached and left bottom are shown as vertical dashed lines. The time difference between solid vertical lines is defined as "tow duration" and the difference between vertical dashed lines is defined as "bottom contact time". The left panels show the full trace for each tow and the right panels only show the period when the net was in contact with bottom. The bottom contact sensor recorded a tilt angle every six seconds.

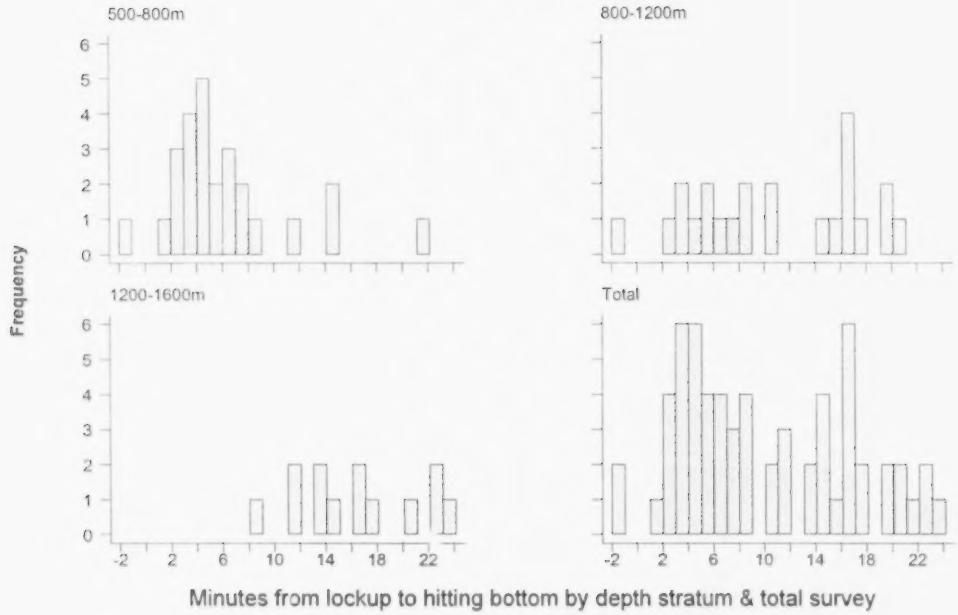

Figure 6. Frequency distributions of time (minutes) from winch lockup time to the time that the net hit bottom as determined from bottom contact sensor data. All tows with bottom contact data are used to summarize time delays by depth stratum and for the entire survey.

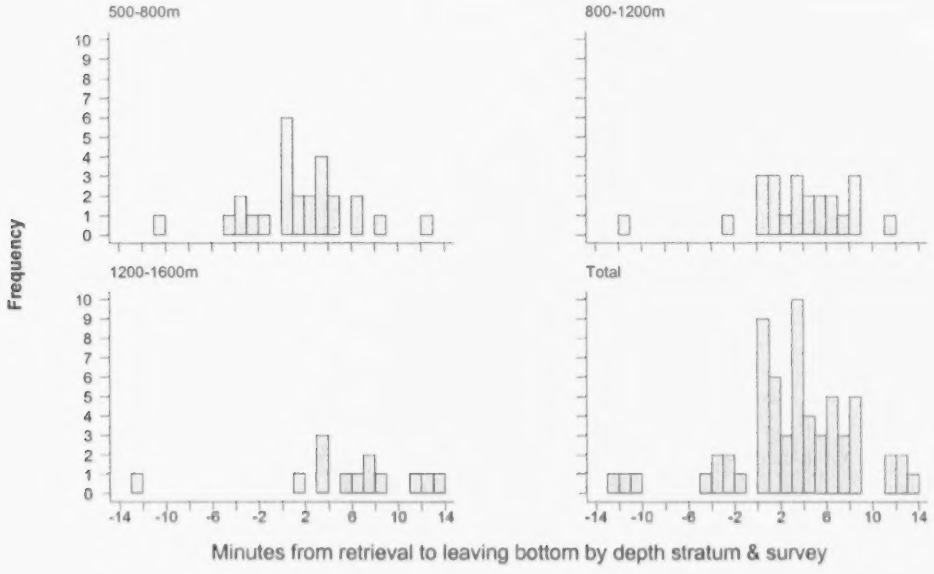

Figure 7. Frequency distributions of time (minutes) from the net retrieval time to the time that the net left bottom as determined from bottom contact sensor data. All tows with bottom contact data are used to summarize time delays by depth stratum and for the entire survey.

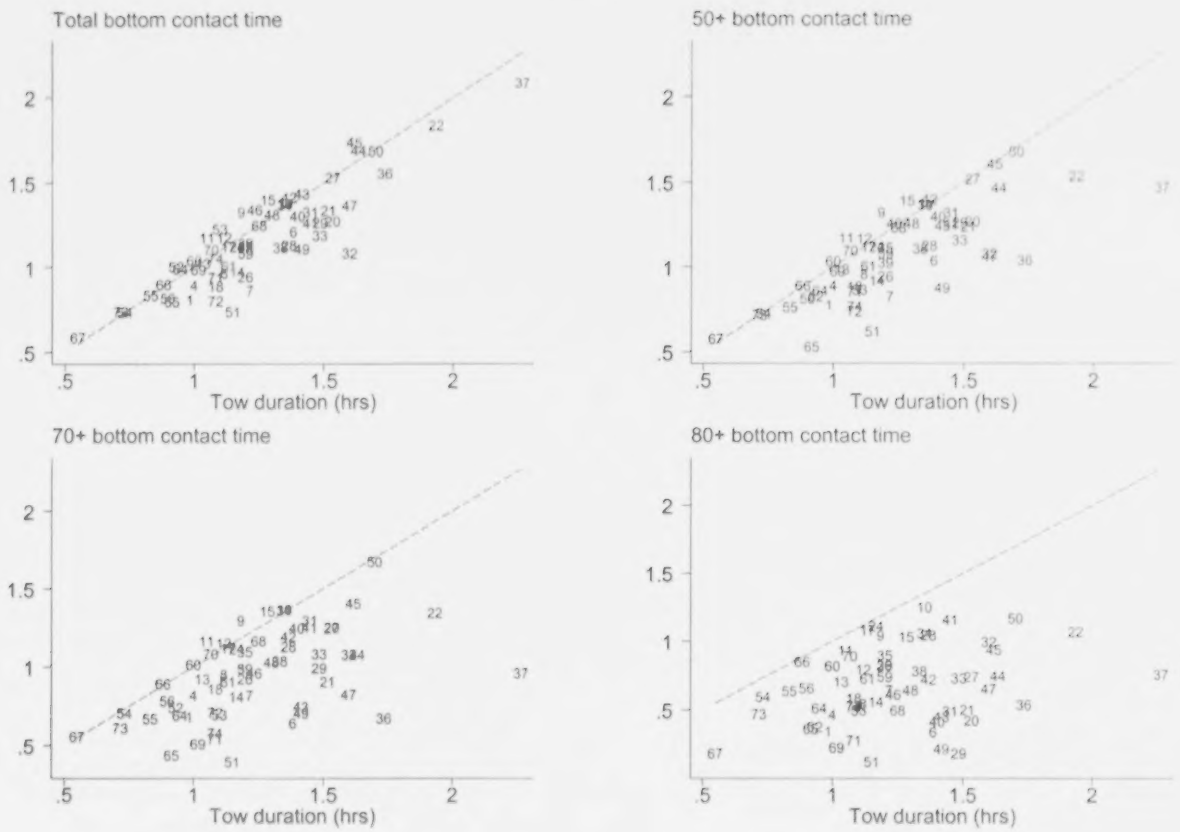

Figure 8. Plot of four measures of bottom contact time as a function of tow duration (i.e. [net retrieval time] – [winch lockup time]) for all valid tows. Dashed line shows 1:1. The four measures are: a) total bottom contact period from the time the net touches bottom to the time it leaves bottom; b) total time with a tilt angle of 50° or greater; c) total time with a tilt angle of 70° or greater; d) total time with a tilt angle of 80° or greater. Points are plotted using set numbers.

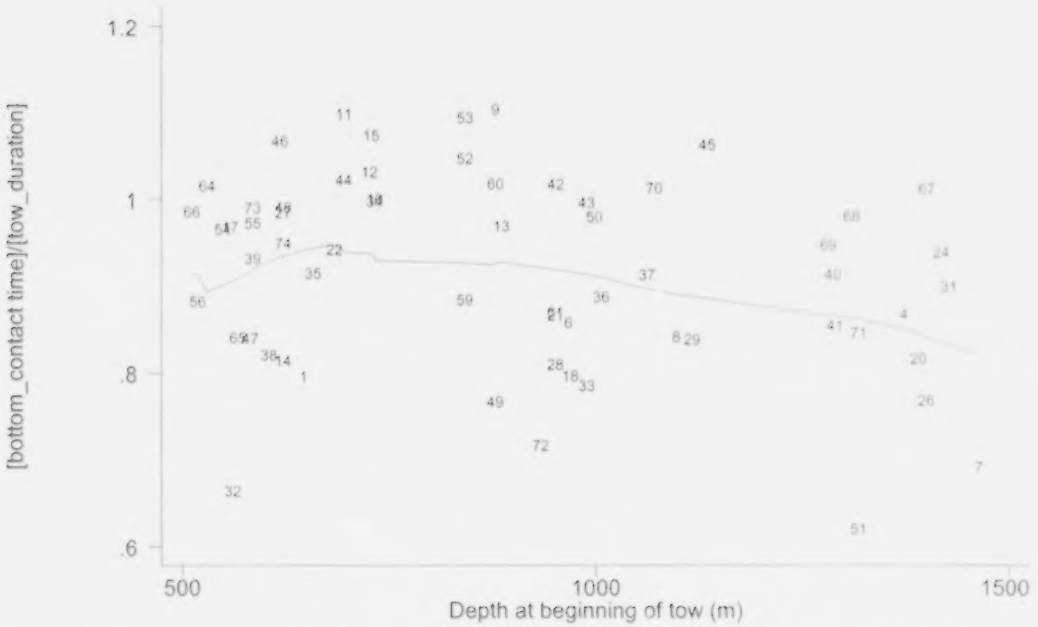

Figure 9. Relationship of the bottom contact time:tow duration ratio (as defined in the caption to Figure 5) against depth at the start of the tow. A locally-weighted regression line (lowess) shows the tendency of the data and set number is used as a plotting symbol.

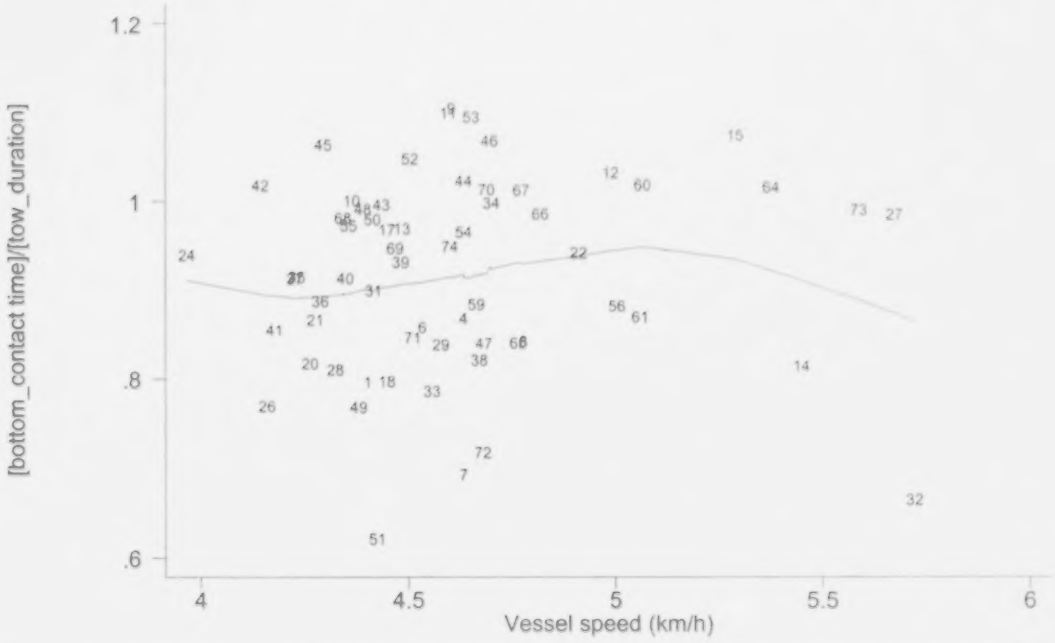

Figure 10. Relationship of the bottom contact time:tow duration ratio (as defined in the caption to Figure 5) against the mean vessel speed for the tow. A locally-weighted regression line (lowess) shows the tendency of the data and set number is used as a plotting symbol.

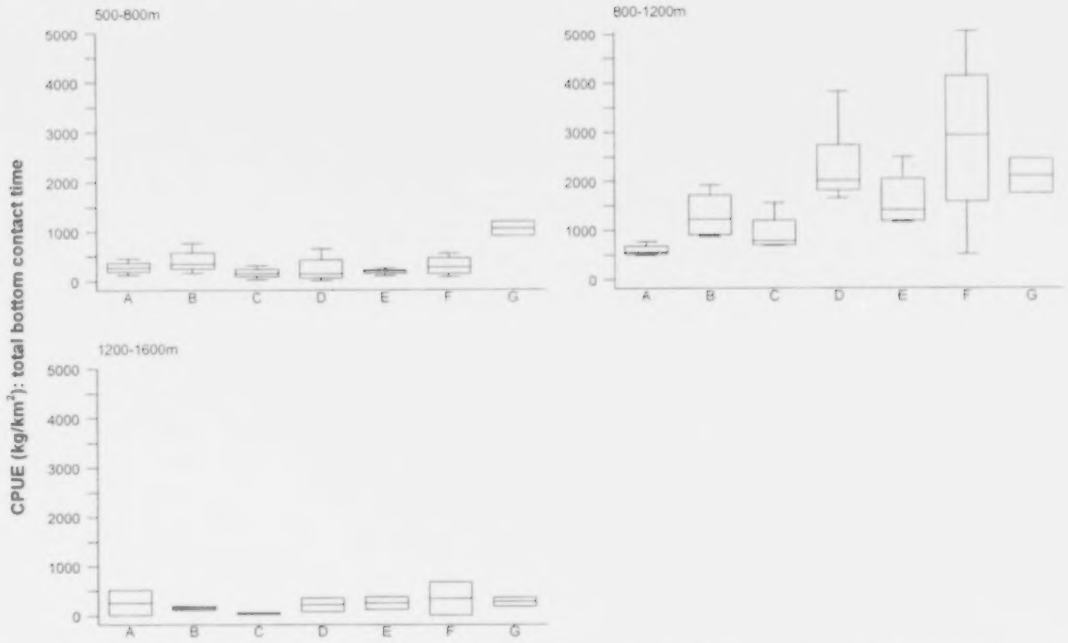

Figure 11. Box plots of the distribution of longspine thornyhead density ([kg/km^2]: based on wingspread and total bottom contact time for each valid tow) by depth zone and area stratum.

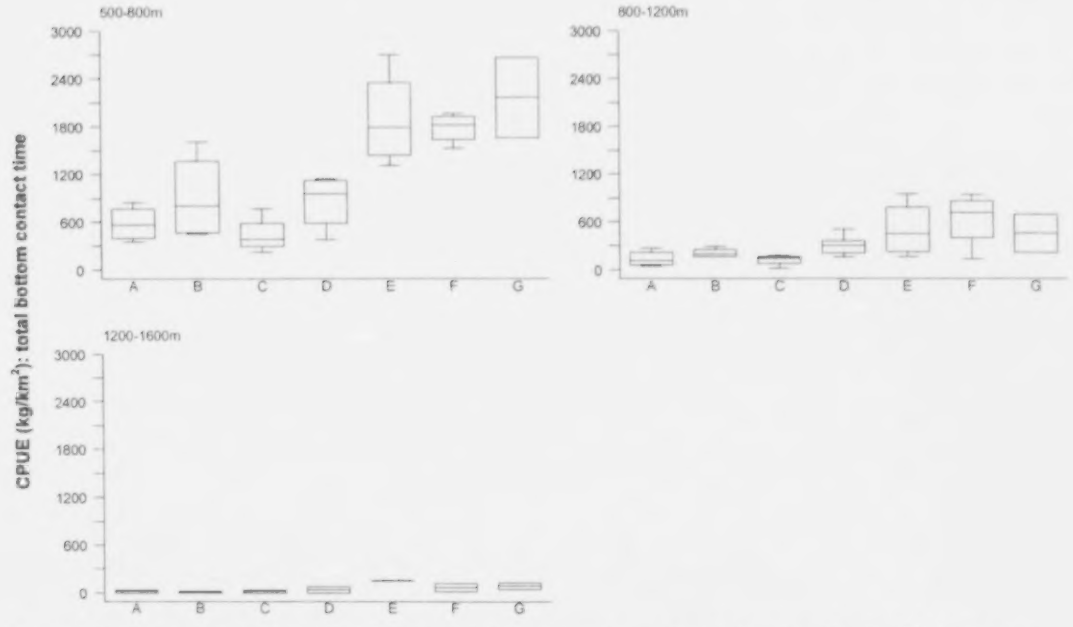

Figure 12. Box plots of the distribution of shortspine thornyhead density ([kg/km^2]: based on wingspread and total bottom contact time for each valid tow) by depth zone and area stratum.

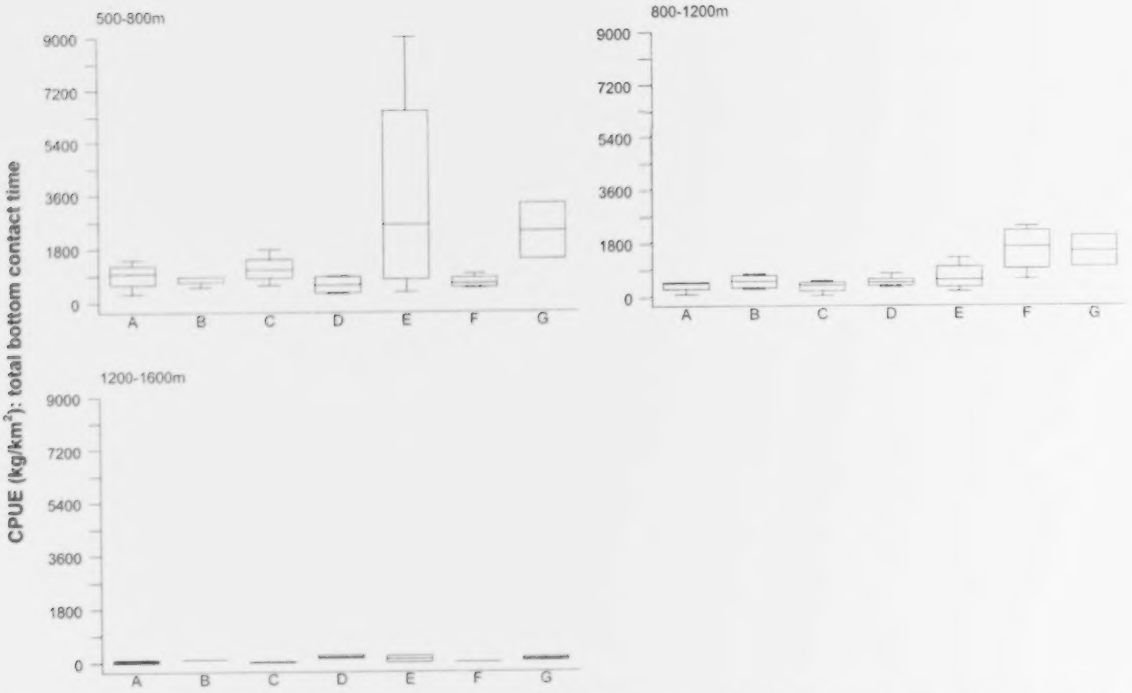

Figure 13. Box plots of the distribution of sablefish density ([kg/km^2]: based on wingspread and total bottom contact time for each valid tow) by depth zone and area stratum.

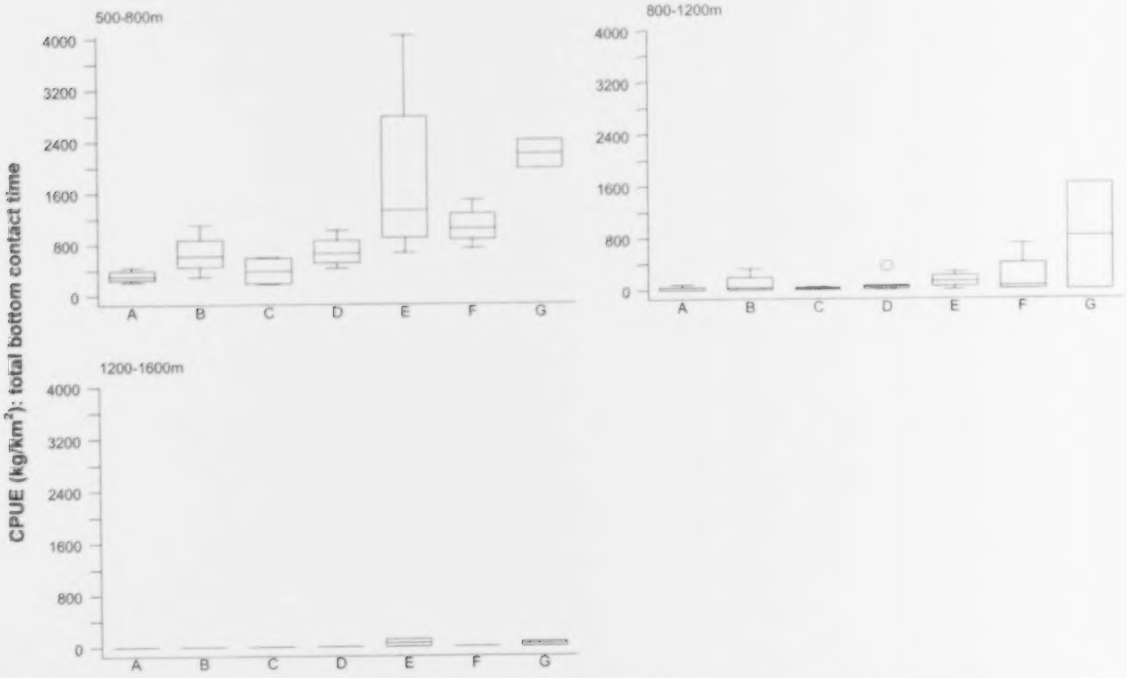

Figure 14. Box plots of the distribution of Dover sole density ([kg/km^2]: based on wingspread and total bottom contact time for each valid tow) by depth zone and area stratum.

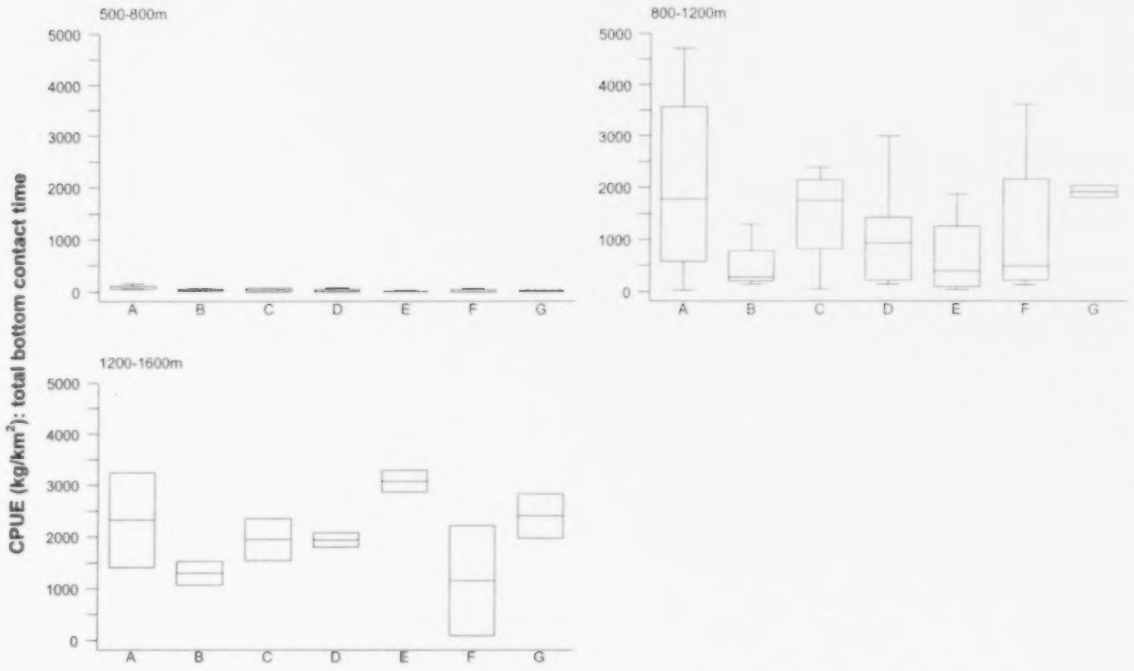

Figure 15. Box plots of the distribution of roughscale rattail density ([kg/km^2]: based on wingspread and total bottom contact time for each valid tow) by depth zone and area stratum.

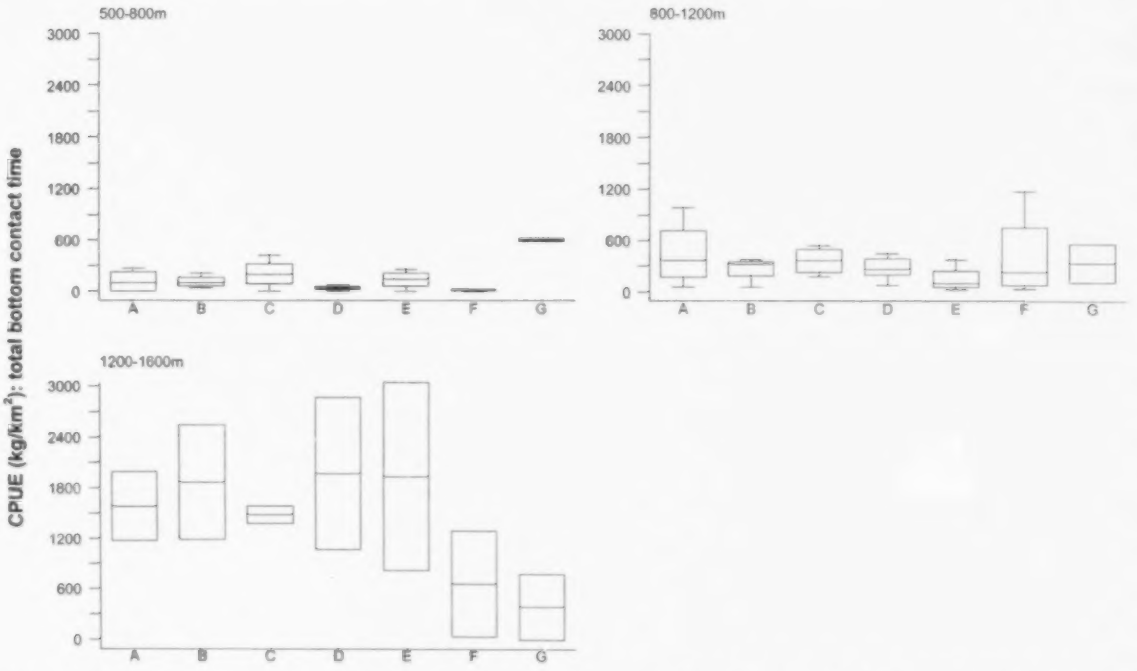

Figure 16. Box plots of the distribution of pectoral rattail density ([kg/km^2]: based on wingspread and total bottom contact time for each valid tow) by depth zone and area stratum.

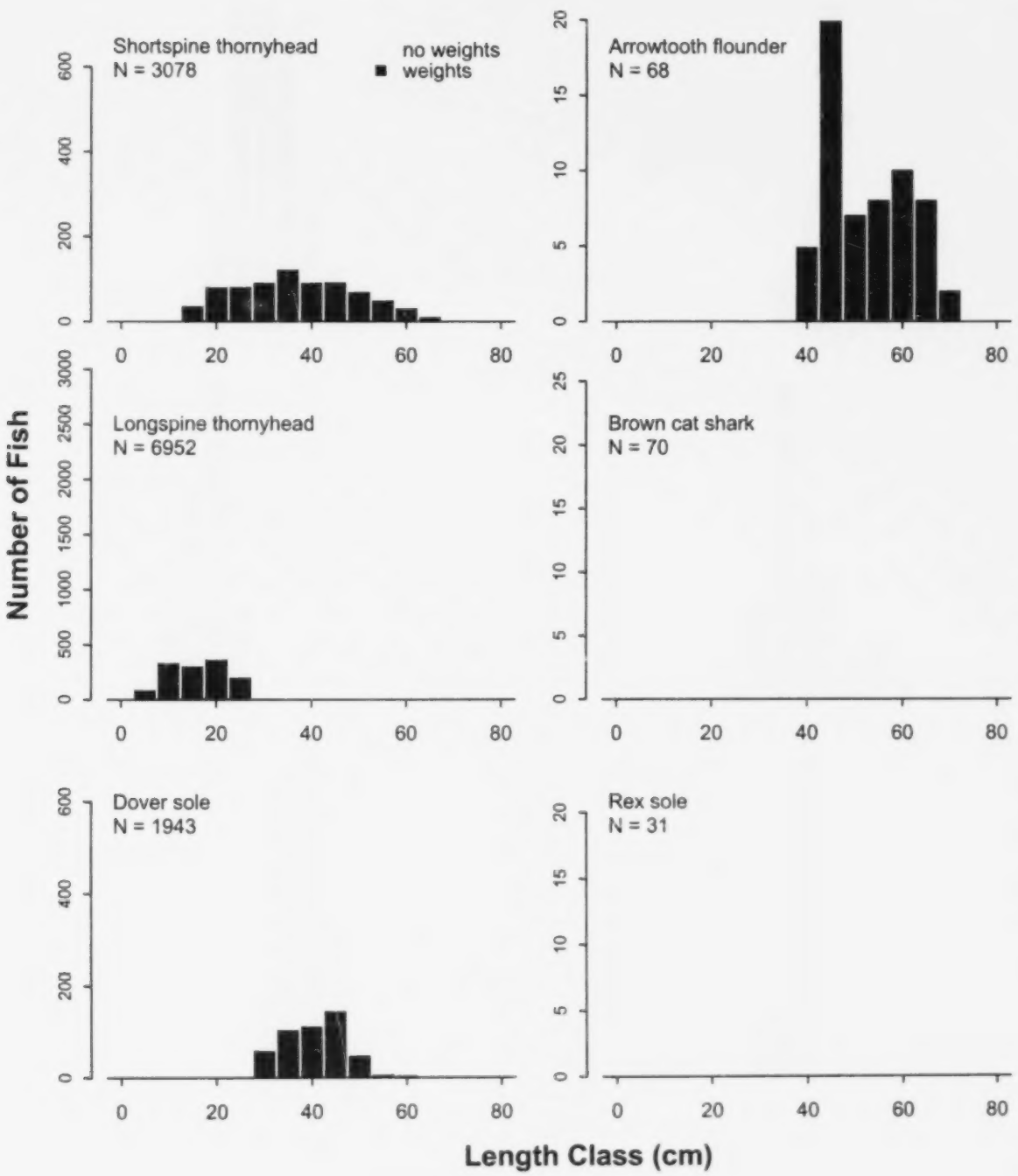

Figure 17. Length frequency distributions of sampled target species showing the numbers of specimens with (■) and without ( ) associated weight data. Length frequencies are not adjusted to reflect the entire catch.

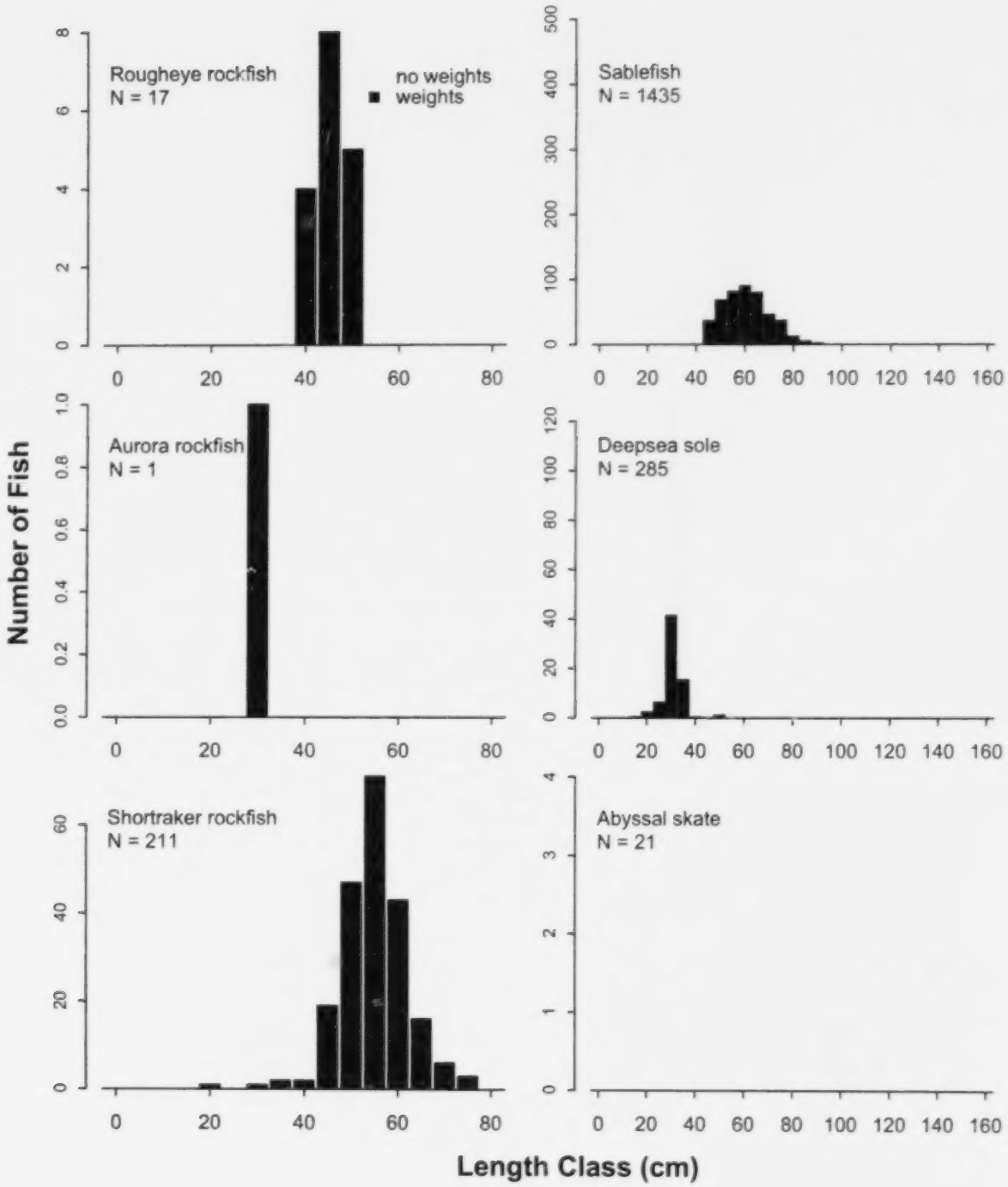

Figure 17. Length frequencies (continued).

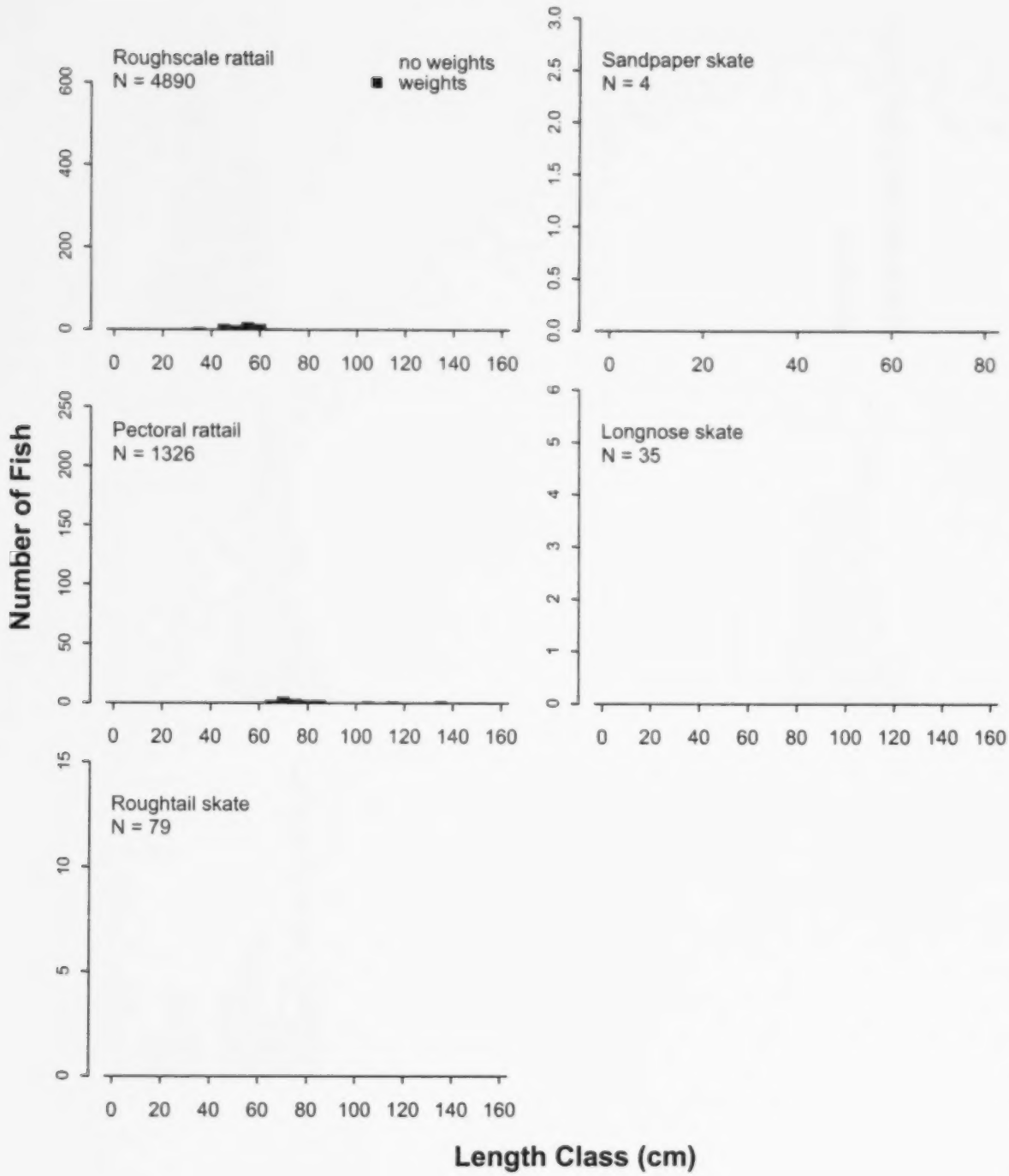

Figure 17. Length frequencies (continued).

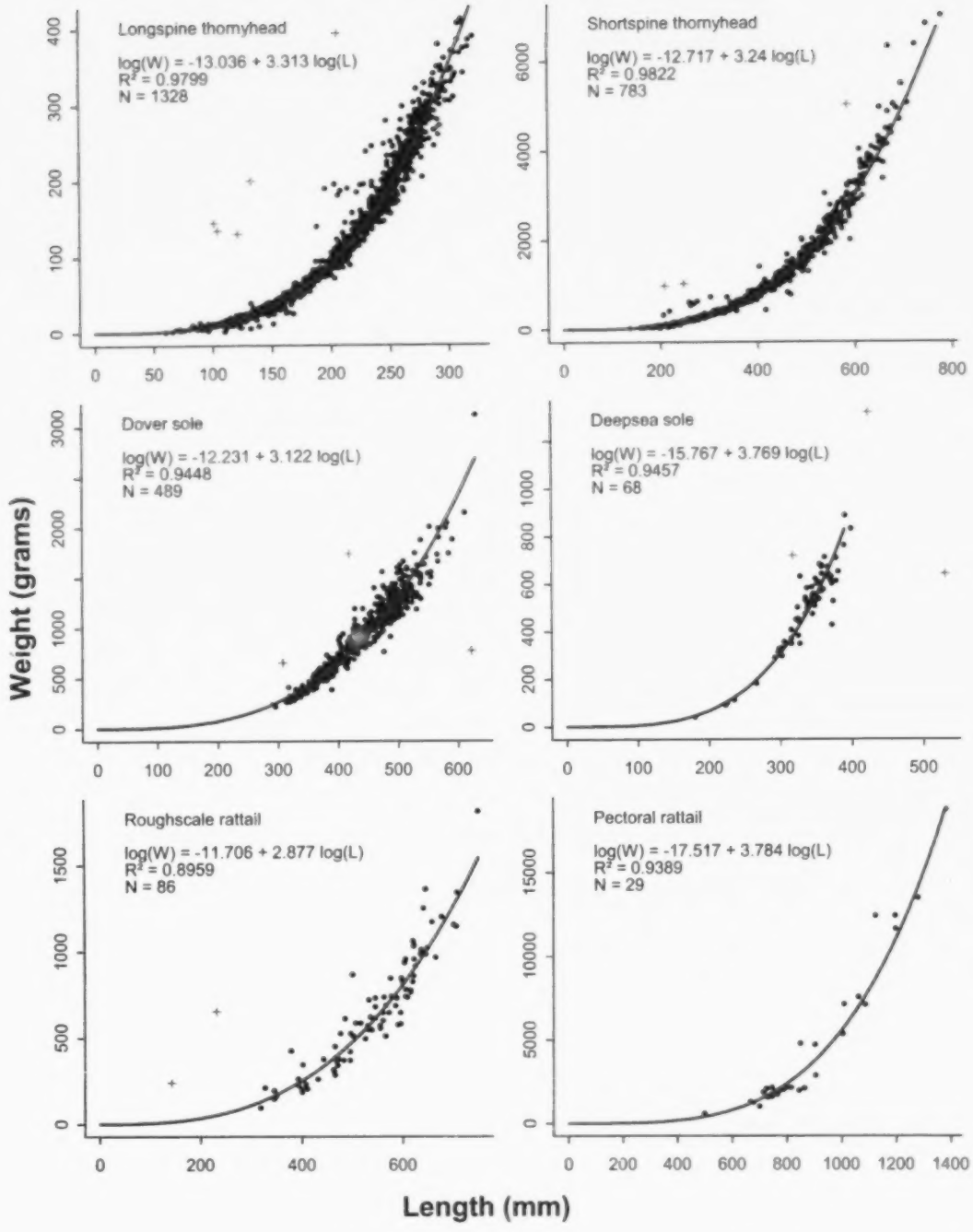

Figure 18. Regression plots of weight versus length for six target species. Data outliers are indicated by '+' and are excluded from regression analyses.

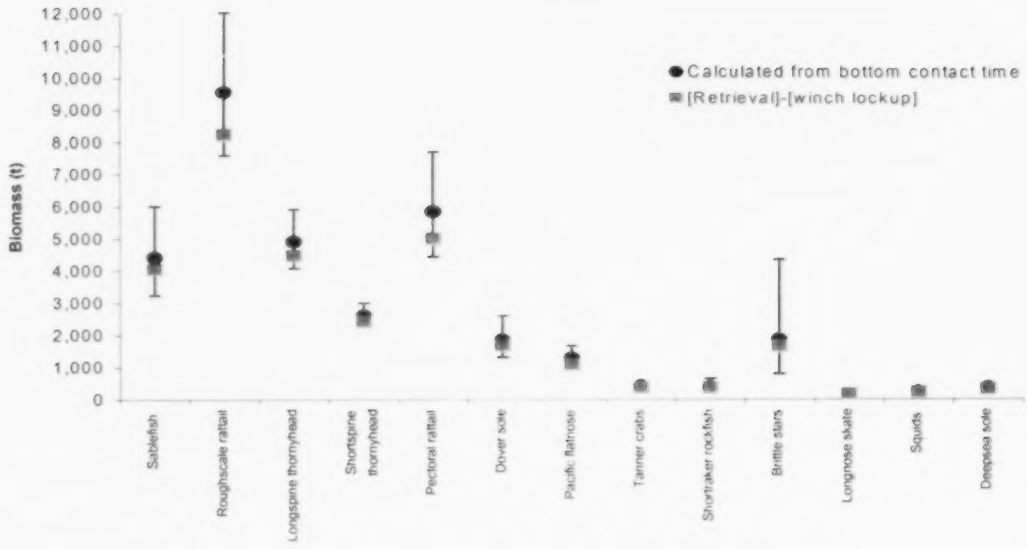

Figure 19. Biomass estimates and confidence bounds for thirteen species in the 2002 survey using: 1) CPUE estimates based on total bottom contact time (Eq. 5) and 2) CPUE estimates calculated from winch lockup to retrieval time (Eq. 4). Error bars are $UB_s = B_s e^{\left(-RE_s^2/2\right)} e^{(1.96 * RE_s)}$ and $LB_s = B_s e^{\left(-RE_s^2/2\right)} e^{(-1.96 * RE_s)}$ plotted for the biomass estimates using bottom contact time only and assuming a lognormal distribution.

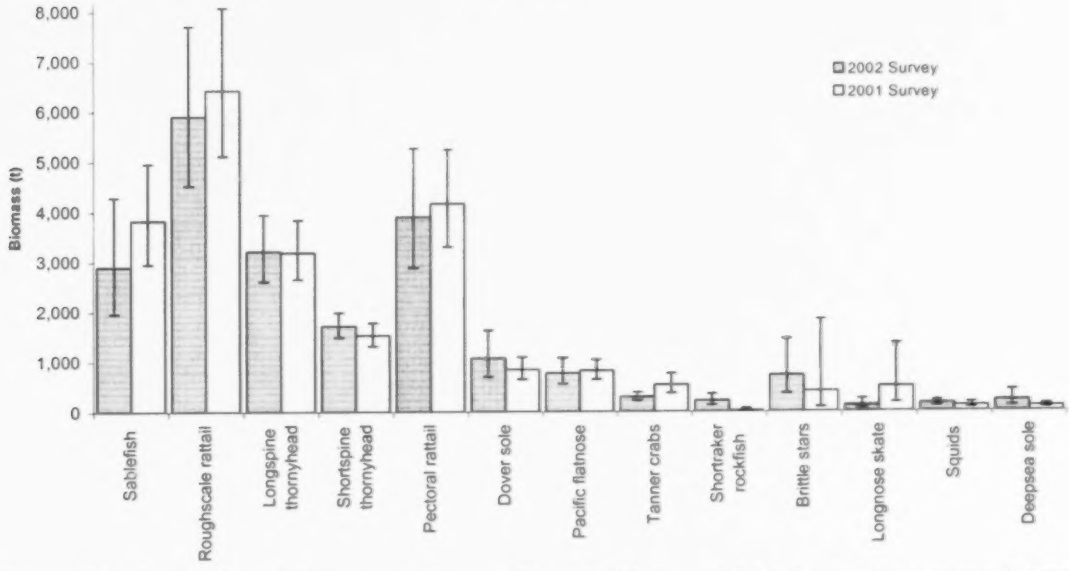

Figure 20. Comparison of biomass estimates from the 2001 and 2002 longspine surveys for thirteen species using CPUE estimates calculated from winch lockup to retrieval time and using areal strata A to F only (Table 1). A constant wingspread of 20 m is assumed for both surveys. Error bars, assuming a lognormal distribution, are $UB_s = B_s e^{\left(-RE_s^2/2\right)} e^{(1.96 * RE_s)}$ and $LB_s = B_s e^{\left(-RE_s^2/2\right)} e^{(-1.96 * RE_s)}$.

APPENDIX A. Design for the 2002 west coast Vancouver Island Longspine Thornyhead Survey (Paul Starr, Canadian Groundfish Research & Conservation Society, 2002)

Introduction

The design for a longspine thornyhead trawl survey presented in this document is a revision of a similar document drafted prior to the 2001 trawl survey (Starr *et al.* 2002). The initial design considerations for this survey were presented to the Groundfish Sub-committee of the Pacific Stock Assessment Review Committee in 2000 (Starr & Schwarz 2000) which were then subsequently refined and revised based on discussions over a period of nearly eight months between scientists from the Pacific Biological Station, Simon Fraser University, the Canadian Groundfish Research & Conservation Society (CGRCS), and the US National Marine Fisheries Service. There was also consultation with Department of Fisheries and Oceans (DFO) management and with representatives of the fishing industry. The 2001 survey was conducted from 15 September to 02 October and a summary of the results of that survey will be published in August 2002 as a DFO Technical Report (Starr *et al.* 2002).

The design of both the 2001 and 2002 trawl surveys is targeted at the longspine thornyhead resource. This aspect is reflected in the depth range selected for the survey and the survey coverage which is restricted to the west coast of Vancouver Island. The reasons for this decision are:

1. all parties recognise that the developing thornyhead fishery requires robust fisheries data which can be incorporated into future stock assessments;

2. thornyheads appear to be distributed relatively uniformly on the bottom (Wakefield 1990) compared to other slope/shelf rockfish species which translated into a low relative error (RE) in the initial survey;

3. this survey represents the second of a three-year commitment on the part of the CGRCS to support new research on longspine thornyheads.

Objectives of the survey

1. To estimate the relative abundance of longspine thornyhead lying between a southern boundary defined by the Canada-US border and a northern boundary defined approximately by 50° 30' N between the depths 500 m and 1 600 m. The target RE of the biomass estimate is 20% $\left(RE = \mu/SE\right)$ (where μ is the mean biomass for the survey and SE is the standard error of the biomass estimate).

2. To estimate the distribution by size class and sex category of the longspine thornyhead population within the extent of the survey area, given the uncertainty that results from sampling with non-representative fishing gear.

3. To obtain quantitative biological information pertaining to selected finfish and invertebrate species.

Survey Charter and Personnel

4. The charter for the 2002 west coast Vancouver Island longspine survey has been awarded to the F/V Ocean Selector, Dave Clattenberg skipper.

5. The survey leader will be Paul Starr of the Canadian Groundfish Society. He will be on board the Ocean Selector for the first four to five days of the survey. Ed Choromanski of DFO will be on board the Ocean Selector for the full duration of the survey and a second DFO representative will likely come on board when Paul Starr disembarks. Archipelago Marine Research will provide two experienced marine observers to assist with sampling of every tow and with data recording for the entire period of the survey. Brian Krishka (DFO) will also be involved in the survey by providing land-based organization and other support as required. A list of contact phone numbers and email addresses for all survey and affiliated personnel is provided in Appendix A2 **[excluded from this version of the report for reasons of confidentiality].**

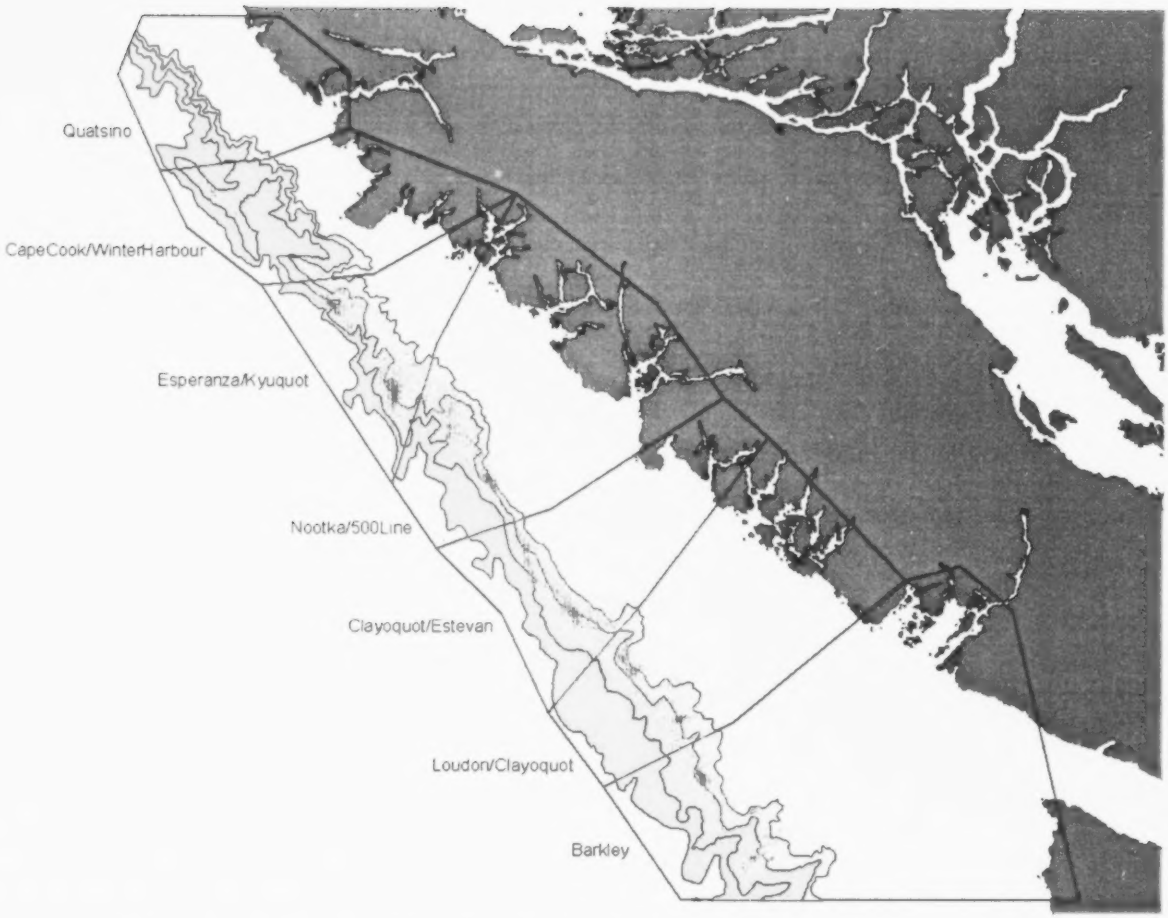

Figure A1. Map of the seven survey strata with most of the relevant tows in the PacHarvest database (over period 15 February 1996 to 01 April 2002).

Elements of this design

6. The survey will be targeted at the vulnerable slope and shelf rockfish species between the depths of 500 and 1600 m. It will be conducted on the west coast of Vancouver and will use the same six areal strata as were used in the 2001 survey. A seventh areal stratum has been added in 2002 to accommodate the revised northern limit (at 50° 30') of the southern longspine thornyhead management area (Figure A1). It is believed that these areal strata largely reflect the natural boundaries of the existing longspine thornyhead fishery. Although the analysis of the 2001 survey data indicated that areal stratification did not substantially improve the statistical performance of the survey, the use of these strata ensures good geographical coverage for the survey.

7. Each areal stratum is divided into three depth strata: 501–800 m; 801–1200 m; 1201–1600 m. The use of these depth strata reduced the calculated RE for longspine thornyheads from about 15% for a completely random survey to below 10% using the depth strata only. The inclusion of these depth strata significantly improved the performance of the survey design and will be retained in 2002.

8. The number of tows allocated to each areal stratum is designed to ensure that a reasonably high level of precision for longspine thornyheads is achieved over the entire survey area, based on an analysis of the existing catch and effort data for longspine thornyheads (Starr & Schwarz 2000). The design requires 10 tows per areal stratum, 4 tows in each of the two shallower strata and 2 tows in the deepest stratum. This number of tows per stratum resulted in acceptable REs for all the main species caught in the 2001 survey except for longnose skate and brittle stars (Table A1). The number of tows required in the most northerly stratum (Quatsino; Figure A1) has been reduced as the terrain is likely to be very difficult to tow and there have been very few commercial sets in this area.

Table A1. Biomass estimates (t), standard error (SE [t]) and associated relative errors (RE [%]) for the top 12 species by total weight caught in the 2001 west coast Vancouver Island longspine thornyhead survey (Starr et al. 2002).

Species	Biomass (t)	SE (t)	RE (%)
Sablefish	6,039	877	14.5%
Roughscale rattail	8,691	901	10.4%
Longspine thornyhead	4,436	416	9.4%
Pectoral rattail	4,460	392	8.8%
Shortspine thornyhead	2,225	227	10.2%
Dover sole	1,180	172	14.6%
Tanner crab	708	123	17.4%
Pacific flatnose	970	85	8.8%
Longnose skate	324	139	42.9%
Squid	132	28	21.0%
Brittle stars	333	282	84.7%
Deepsea sole	143	21	14.7%

9. The following table defines the depth strata selected for this design and the time to be towed in each depth stratum. The target tow time in each stratum has been set to 1 hour to ensure that large catches are minimized and to reduce sub-sampling. These tow times should be considered as a target and some tows may be shorter or longer, depending on bottom conditions or other considerations. Note however, that a minimum of 0.5 hours of bottom contact as defined by the bottom contact sensor will be required to accept the tow as valid for the survey (the requirement is reduced to 15 minutes for the three northern strata: Esperanza/Kyuquot; Cape Cook/Winter Harbour and Quatsino).

Depth Stratum	Number of assigned tows	Approximate length of tow in stratum[1]
501 – 800 m	4	1 hour
801 – 1200 m	4	1 hour
1201 – 1600 m	2	1 hour

[1] Defined as the time between winch lockup and the beginning of retrieval. A minimum of 0.5 hours in contact on the bottom was established during the first survey and will continue into surveys 2 and 3. This requirement is reduced to 0.25 hours for the 3 most northerly strata (Esperanza/Kyuquot; Cape Cook/Winter Harbour and Quatsino).

10. The design provided in Table A2 is based on the assumption that tows will be chosen randomly from a prescribed list of locations. If a tow location is not feasible, then another tow will be selected from a list of alternative random tow locations in a specified sequence.

Table A2. Survey design based on equal allocation of tows to each of the 7 areas defined in Figure A1.

Longspine Area	501-800	801-1200	1201-1600	Total all depths
Barkley	4	4	2	10
Loudon/Clayoquot	4	4	2	10
Clayoquot/Estevan	4	4	2	10
Nootka/500 Line	4	4	2	10
Esperanza/Kyuquot	4	4	2	10
Cape Cook/Winter Harbour	4	4	2	10
Quatsino	2	2	2	6
Total	**26**	**26**	**14**	**66**

Protocol for survey and survey gear

11. This survey is the second of a planned series of three surveys to be conducted in the late summer/early autumn of 2001, 2002 and 2003. It is a requirement of the survey contract that the vessel master is a specialist in the Canadian longspine fishery. The contract is held by the Ocean Selector with skipper Dave Clattenberg.

12. Two nets (#2 box trawl each built to the same agreed specifications) are to be used for the survey and will be retained by the CGRCS for continuity. These nets will have a 50 mm (2 inch) cod end liner made from braided knotless web, Thyboron 107 doors will be used and bridles for the net and a pair of suitable main warp cables will provided by the vessel. The length of the warp and the weight of the doors are to be measured accurately prior to the beginning of the survey.

13. The survey contract specifies that the net must be restored to its original condition whenever it is mended and that the condition of the net be externally audited at the beginning of each subsequent survey based on a set of written specifications that will be drawn from the original net design.

14. The following net monitoring equipment have been made a condition of the survey contract: a) doorspread monitor; b) wingspread monitor; c) pressure depth monitor; d) codend sensor; e) temperature sensor; f) headline height sensor. At least one "bottom contact sensor" will be borrowed from the US National Marine Fisheries Service (as in 2001). This device will give a complete monitoring of the period of contact with the bottom during each tow.

15. The survey is presently scheduled to begin on 03 September and will continue until the 66 tows described in Table A2 are completed. This should take approximately 15-18 days to complete, depending on the weather conditions.

16. Some gear trials may be necessary to properly determine the deployment of the gear and the electronic net monitoring gear.

Protocol for selecting and conducting survey tows

17. Tows will be allocated to 7 areal strata using three depth strata described in Table A2, for a total of 21 separate sub-strata. The depth boundaries will be determined by the mean interpolated depth lines (500 m, 800 m, 1200 m, and 1600 m) based on available bathymetric data (Figure A1). This is to ensure that the strata definitions are continuous. The definitions of these 21 sub-strata are maintained by Rowan Haigh of DFO.

18. Each areal/depth sub-stratum will be characterized by a set of 500 m X 500 m grids (e.g., Figure A2). There are approximately 33,500 of these grids (or about 8,400 km2) within the survey area (Table A3). A list containing a sequence of randomly selected grid co-ordinates from each of the 21 area/depth sub-strata will be provided to the Ocean Selector from which each tow is to be executed until the required number of tows for that sub-stratum is completed. The vessel master is to select a starting location for the tow so that he can pass through the selected grid while maintaining the bottom contact specifications and staying within the boundaries of the sub-stratum. If no such location exists (e.g., too much foul ground or no depth within the current depth definition), then the next randomly selected grid on the list will be sampled.

19. Tows in each sub-stratum will be conducted for about one hour from winch lockup to retrieval at a speed of 2.2 nmi/h with no more than ±10% variation. The minimum period of bottom contact will be 0.5 hours for the 4 southern strata (Barkley, Loudon/Clayoquot, Clayoquot/Estevan, Nootka/500 Line), as determined from the total time that the bottom contact sensor is registering 80° or greater declination. As this cannot be determined until after the tow has been completed, the skippers during the first survey tended to extend the tow well beyond the minimum period to ensure that this requirement was met. The bottom contact requirement was relaxed in 2001 to 0.25 hours in the 2 more northerly strata (Esperanza/Kyuquot and Cape Cook/Winter Harbour) to accommodate the more difficult bottom topography in those strata and this practice will be continued in the 2002 survey for Esperanza/Kyuquot, Cape Cook/Winter Harbour and Quatsino areal strata. However, longer bottom contact times in these strata are preferred if this is possible to achieve.

20. Once a tow location is selected in the 4 southern strata (Barkley, Loudon/Clayoquot, Clayoquot/Estevan, Nootka/500 Line), the skipper is required to tow so that the net passes within 250 m of the designated survey point while maintaining the required minimum bottom contact time (as described in Paragraph 18) and staying within the stratum definition of area and depth range. The requirement to pass within 250 m of the selected random location is relaxed to 2000 m in the three northern strata (Esperanza/Kyuquot; Cape Cook/Winter Harbour and Quatsino), again to accommodate the more difficult bottom topography.

21. An ordered list of 25 randomly selected grid locations will be provided for each of the 21 sub-strata described in Table A2 (7 areal strata X 3 depth strata). The skipper of the Ocean Selector will be asked to tow, in any order, the first four locations on the list. However, the skipper is allowed to reject a randomly selected tow location for any of the three reasons listed in Paragraph 22. Additional reasons for discarding random tows can be added if the survey leader (Paul Starr) agrees. However, the list provided in Paragraph 22 are the reasons used in the 2001 survey and should not be changed substantially in future surveys to ensure comparability with the 2001 survey.

22. Acceptable reasons for discarding a randomly selected tow location and taking the next location:

    1. The bottom topography is not suitable for completing the tow requirements (too much foul ground).
    2. The random grid location does not conform to the sub-stratum definitions (i.e. wrong depth[1] or outside the defined sub-stratum boundaries).
    3. Towing the random grid location means a substantial overlap with a previously selected tow line. The definition of "substantial" is not exact but should be at least 50% same coverage as determined jointly by the skipper and the lead scientist on board.

[1] Do not accept tows which have more than 5–10% of the total track distance at the wrong depth due to undulating bottom topography, based on a decision jointly made by the skipper and the lead scientist on board the vessel. If the tow track enters a different depth stratum at the end of a tow, it is better to simply end the tow as soon as the depth stratum changes.

23. The number of tows presented in Table A2 **must all be completed successfully** for each of the 21 sub-strata. The skipper is required to select random grid locations in the order presented in the list described in Paragraph 21 until all tows are completed. Random grid locations can only be skipped if they conform to one of the reasons listed in Paragraph 22. If a tow fails the minimum requirements (speed, distance from the grid location, or bottom contact time) described in Paragraphs 19and 20, then that tow must be discarded and replaced with a tow made through the next random grid location on the list. This procedure is continued until all the required tows for that sub-stratum have been completed.

24. During each tow, vessel direction, speed, depth, position and distance traveled will be manually recorded at least every 10 minutes during the tow, starting from when the winch has been locked. Readings from the Scanmar system, including headline height, net depth, water velocity at the entrance of the net, doorspread, wingspread, codend sensor reading, and water temperature at the net will be recorded at the same interval reading. Additionally, the length of warp out, the wind speed and wind direction will also be recorded at this time. Any comments pertaining to the preceding interval can also be recorded on the form. The bottom contact sensor is to be attached to the net footrope and the data are to be downloaded after every tow.

Table A3. Approximate number of 500 m X 500 m grids and percentage distribution in each of the 21 depth/area sub-strata presented in Table A2.

	501-800		801-1200		1201-1600		Total all depths	
Longspine Area	**# Grids**	**% Total**	**# Grids**	**% Total**	**# Grids**	**% Total**	**# Grids**	**% Total**
Barkley	1 965	5.9%	2 756	8.2%	2 351	7.0%	7 072	21.1%
Loudon/Clayoquot	1 323	3.9%	1 478	4.4%	2 790	8.3%	5 591	16.7%
Clayoquot/Estevan	1 060	3.2%	1 517	4.5%	1 846	5.5%	4 423	13.2%
Nootka/500 Line	1 059	3.2%	1 552	4.6%	1 807	5.4%	4 418	13.2%
Esperanza/Kyuquot	1 701	5.1%	1 442	4.3%	1 041	3.1%	4 184	12.5%
Cape Cook/Winter Harbour	764	2.3%	2 160	6.4%	2 297	6.9%	5 221	15.6%
Quatsino	525	1.6%	860	2.6%	1 214	3.6%	2 599	7.8%
Total	8 397	25.1%	11 765	35.1%	13 346	39.8%	33 508	100.0%

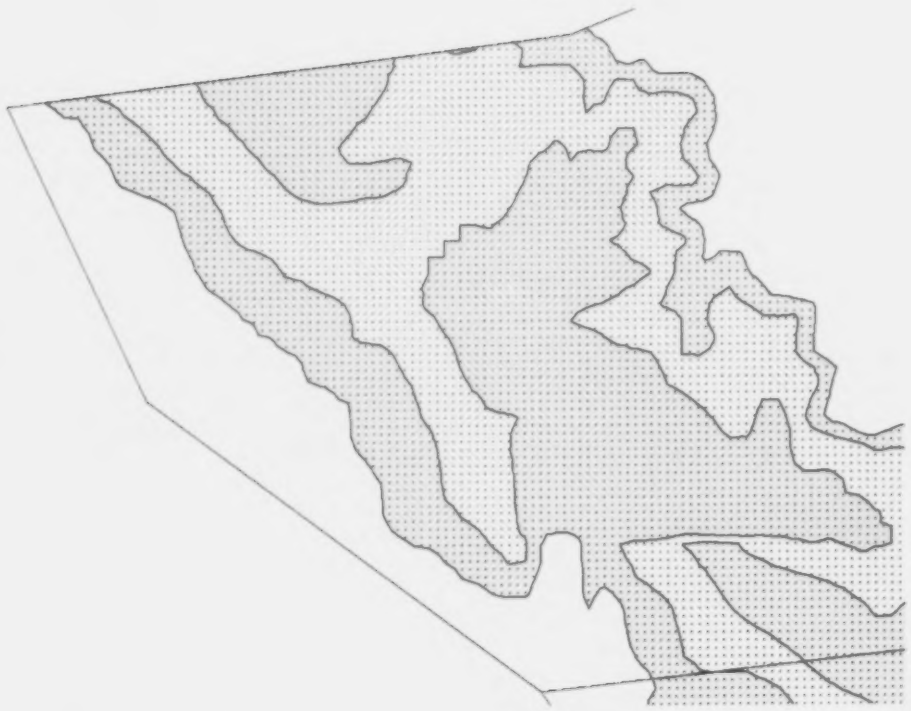

Figure A2. Diagram for areal stratum 6 (Cape Cook/Winter Harbour) showing proposed 500 m X 500 m grid locations from which random locations will be selected (each location is represented by a single dot which may not be readily visible in a printed version of this document).

Provision for untrawlable areas

25. In 2001, the set of 500 X 500 m grids was shown to Chris Roberts, one of the skippers of the Viking Storm, with the request that he indicate areas of known untrawlable bottom. In the end, 26 areas were identified covering about 15% of the available area (about 1,300 km^2 Figure A3). These grids were distributed unevenly among the 6 areal strata fished in 2001, with Nootka/500 Line and Cape Cook/Winter Harbour accounting for over 50% of the excluded grids and Clayoquot/Estevan accounting for less than 3% (Table A4). The percentage of excluded grids was approximately equal among the two shallower depth strata and the deepest stratum accounted for less than 10% of the exclusions, which is probably indicative of the lack of exploration in these depths.

26. It is not proposed to change the current definition of the survey area in 2002 by adding additional excluded grids. This decision has been made to maintain comparability between years.

Table A4. Distribution of grids excluded in 2001 by depth and area strata expressed as a percentage. Note that the total number of excluded grids is about 15% of the total area of the combined area from Barkley to Cape Cook/Winter Harbour.

Longspine Area	501-800	801-1200	1201-1600	Total all depths
Barkley	8.5%	5.7%	0.0%	14.1%
Loudon/Clayoquot	8.5%	3.2%	0.0%	11.6%
Clayoquot/Estevan	2.5%	0.0%	0.0%	2.5%
Nootka/500 Line	9.8%	14.9%	1.8%	26.5%
Esperanza/Kyuquot	8.7%	5.8%	0.5%	15.0%
Cape Cook/Winter Harbour	9.9%	16.0%	4.4%	30.3%
Total	47.9%	45.5%	6.7%	100.0%

Figure A3. Outlines of the excluded areas (red polygons) in the six areal strata as provided by Chris Roberts from the Viking Storm.

Protocol for sampling survey tows

27. For each tow, the following data will be collected:

a. total catch in **numbers** and **weight** for all commercially important or potentially commercially important species of fish (including elasmobranchs). This category will be separated out to the species level. If the catch is too large to weigh in aggregate, the total weight can be estimated by successively weighing individual fish bins.

b. total catch in numbers and weight for invertebrate species separated to the Family or Order level as appropriate. Crabs (queen and tanner) can be separated into species categories.

c. the following list of species will be sampled for biological characteristics (length, sex and maturity stage). If the catch of that species is too large to sample every fish, then a random sub-sample will be taken for that species. The sub-sample will be weighed to determine the proportion by weight that is sampled of that species.

Species	Length/sex/maturity sample (every tow)	Otolith sampling	Target number otoliths	Random age sample
Longspine thornyheads	YES	LENGTH STRATIFIED	1000	1 tow
Shortspine thornyheads	YES	LENGTH STRATIFIED	600*	1 tow
Shortraker rockfish	YES	EVERY FISH*	200	NO
Rougheye rockfish	YES	EVERY FISH*	200	NO
Dover sole	YES	LENGTH STRATIFIED	500	1 tow
Deepsea sole	YES	NO	N/A	NO
Turbot	YES	EVERY FISH*	200	NO
Sablefish	YES	LENGTH STRATIFIED*	500*	1 tow
Roughscale grenadier	YES[1]	NO	N/A	NO
Pectoral grenadier	YES[1]	NO	N/A	NO
Any sharks or skates	YES[1]	NO	N/A	NO

[1] maturity not required

* indicates a change from 2001 protocol

d. maturity protocols for the appropriate species groupings (flatfish, slope rockfish) will be provided by DFO. There is no specific maturity protocol yet developed for the thornyhead species, but a provisional schedule based on information collected during the 2001 survey will be applied in 2002. The maturity schedule used for

longspine and shortspine thornyheads in the 2001 survey was based on a two-stage categorisation derived from an email from Bob Lauth of the NMFS (Appendix A1).

e. otoliths will be taken for the indicated finfish species. The sampling strategy to be used is described in Paragraph 29and Table 5. Otoliths from each length/sex stratum will be collected from the catch as required. Only take one or two otoliths per length/sex stratum in any one tow so that the sampling is spread throughout the entire survey.

f. the three species indicated in the above table should also have one tow sampled randomly during the survey while the tow is sub-sampled for length/sex/maturity.

g. the fish selected for otolith sampling in Paragraph 27.c will also be individually weighed to generate a length-weight key.

28. Sampling the catch:

a. the entire catch will be initially sorted by species or invertebrate group. Each category will be then counted and weighed.

b. the entire catch for the species in listed in Paragraph 27.a will be measured for length and the sex and maturity state for each fish will be determined. If there are more than 150 fish in any category, then that category can be sub-sampled by estimating the total number of fish in the sample and then determining the frequency of selection that would be required to get a sample of approximately 100 fish (e.g.. if there are 600 fish, then a sample of 1 in every 6 fish is required). Once this fraction has been determined, then the **entire** catch of that category must be rigorously selected using the determined fraction, even if this results in a larger than expected sample size. If the sample size is too small, then the procedure must be repeated using a larger fraction of the catch category.

c. if the catch is bimodal for a particular species (e.g., a large number of small, non-commercial fish and only a few larger commercial-sized fish), then the catch of that species can be sub-divided, with complete enumeration of the less numerous category (usually the large fish category) and sub-sampling of the more numerous category (usually the smaller size classes), as described in Paragraph 28.b. If this occurs, then the total weight of each size category needs to be recorded before sub-sampling and following this procedure essentially means that two new categories have been created from a single category.

d. at least two to three tows should be subsampled and then fully enumerated for thornyheads to ascertain if the sub-sampling procedures are obtaining reasonable samples of the length distribution. This work will involve measuring every fish in the catch after the catch has been sub-sampled using the procedure outlined in Paragraph 28.b.

29. Length and sex stratified otolith sampling targets are provided in Table A5 for the four species using this design. Length bins in this table are designated by the maximum length for each bin; therefore each bin represents all fish larger than the previous bin length to the indicated bin length. The smallest and largest bins are minus and plus groups, with the intent that all smaller and larger fish than the indicated bin size will be sampled. Note that it will be difficult to fill these targets as relatively few fish were sampled in 2001 from these intervals (Table A6) so **every** fish encountered in one of these bins should be sampled. Longspine sampling targets are without reference to sex until the length bins that are greater than 19 cm. This is because it is not possible to determine the sex of a large proportion of the measured fish less than 20 cm. Sampling in the bins other than the plus or minus groups should be spaced evenly throughout the period of the survey. If a tow is randomly sampled for ages, the otoliths taken in that sample can also be included in the overall length-stratified sample.

TableA5. Otolith sampling targets by length interval for the four species with length stratified sampling designs. Length intervals are in centimetres and encompass the 1%tiles and 99%tiles of the length distributions observed in the 2001 survey (except for the 10 cm longspine bin which is the 2%tile). The indicated length interval values are the upper bound of the range. The upper and lower length intervals (grey cells) in each series are plus and minus groups and will include all fish larger or smaller than the indicated length value. Longspine otolith targets are without reference to sex until greater than 19 cm.

Longspine thornyhead				Dover sole			Shortspine thornyhead			Sablefish		
Length	Male	Female	Combined	Length	Male	Female	Length	Male	Female	Length	Male	Female
10	–	–	60	31	20	20	21	20	20	49	20	20
11	–	–	50	33	20	20	23	14	14	51	14	14
12	–	–	50	35	20	20	25	14	14	53	14	14
13	–	–	50	37	20	20	27	14	14	55	14	14
14	–	–	50	39	20	20	29	14	14	57	14	14
15	–	–	50	41	20	20	31	14	14	59	14	14
16	–	–	50	43	20	20	33	14	14	61	14	14
17	–	–	50	45	20	20	35	14	14	63	14	14
18	–	–	50	47	20	20	37	14	14	65	14	14
19	–	–	50	49	20	20	39	14	14	67	14	14
20	25	25	–	51	20	20	41	14	14	69	14	14
21	25	25	–	53	20	20	43	14	14	71	14	14
22	25	25	–	55	20	20	45	14	14	73	14	14
23	25	25	–				47	14	14	75	14	14
24	25	25	–				49	14	14	77	14	14
25	25	25	–				51	14	14	79	14	14
26	25	25	–				53	14	14	81	14	14
27	25	25	–				55	14	14	83	20	20
28	25	25	–				57	14	14			
29	30	30	–				59	14	14			
							61	20	20			

Table A6. Number of fish sampled in the 2001 survey in each of the indicated "plus" and "minus" bins (Table A5) for the species using a length-stratified otolith sampling design.

	Number fish in the indicated "minus" bin	Number fish in the indicated "plus" bin
Longspine thornyhead	74	132
Shortspine thornyhead	23	33
Sablefish	23	38
Dover sole	8	19

DNA sampling

30. Sampling for DNA will not be undertaken in the 2002 survey.

Data logging

31. All data will be placed in the existing DFO GFBio database. Current versions of the event, catch and biological sampling forms will be used. Additional forms will be developed for data systems that are unique to this survey (e.g. net mensuration capabilities).

32. All data will be recorded in hard copy. Data checking will be performed after every tow or in the evening as time permits. On board entry of the data will be attempted but is not expected to be completed.

References

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APPENDIX A-1. Text of Email from Bob Lauth of the Alaska Fisheries Science Center on maturity stages for Longspine Thornyheads.

Maturity for LST's and SST's is a tough one. They do not fit the descriptions of rockfish maturities. So tough in fact that we gave up on it on our slope survey. I believe the only reliable way is using histological means. To begin with, one must be skilled to determine the sex of these fish. I do not believe the NW Center even bothers sexing thornyheads on their slope survey. I generally reserve the duty of sexing to a select few who I know have the experience.

The maturity table we have used in the past is a very simple and general one, as follows:

MALES

1 - IMMATURE - Gonads small, stringlike, and clear or transparent.

2 - DEVELOPING OR INACTIVE - Testes swollen, opaque or translucent, colored tan or white. No milt present in ducts or expressible when testis is sectioned.

3 - MATURE (ACTIVE) - Testes swollen and opaque. Milt present in ducts posterior to testes.

FEMALES

1 - IMMATURE - Gonads small, stringlike, and clear or transparent.

2 - DEVELOPING OR INACTIVE - Ovary swollen and translucent. No tiny eggs present. (Note: often the outer membrane of ovary must be removed to detect eggs.)

3 - MATURE (ACTIVE) - Ovary swollen and translucent or opaque. Tiny eggs present in ovarian tissues.

As you can imagine, this table can be very subjective. Most thornyheads (during the fall) get placed in category 1, regardless that they may have spawned previously. There are a lot of bigger LSTs with small stringlike gonads and a majority of the SSTs under 25 cm are that way. I do not think it is always possible to detect a sexually mature fish during an inactive phase. We rarely see stage 3 males during the fall. Stage 3 females are seen, but different biologists interpret "tiny eggs" differently so the distinction between female stage 2 and 3 is blurred. And, I think there are sexually mature females that have stringlike ovaries in the post-spawning phase that are placed in stage 1 but should actually be place in stage 2.

Perhaps the most useful maturity table would be a 2 scale maturity table: 1) immature – never spawned before 2) sexually mature - spawned before and will spawn again. Trouble is, as stated before, 1) can you reliably sex the fish? and 2) can you reliably use gross examination for determining if these buggers are "sexually mature"? I have concluded that we can do #1 with practice and #2 is a waste of time for your average field biologist.

APPENDIX B. Flatfish gonad condition and maturity stages.

Maturity Stage	Code	Male (testes)	Female (ovaries)
Immature	1	Very small, string-like and somewhat translucent or pinkish in colour.	Very small, translucent or pinkish in colour and somewhat gelatinous in texture.
Maturing	2	Enlarged, a distinct bulge evident but still translucent or pinkish in colour.	Relatively small, pinkish-yellow or cream in colour, granular in texture. No distinct eggs visible.
Developing	3	Enlarged, brown-white or white in colour, firm in texture.	Large, cream or yellow in colour, containing opaque eggs that can be distinguished by direct observation. Sex may be determined externally.
Ripe	4	Large, white and easily broken. No sperm evident.	Containing partly or wholly translucent eggs. Sex easily determined externally.
Spawning	5	Large, white and sperm evident.	Containing entirely translucent, mature ova. Eggs loose and will run from oviducts under slight pressure.
Spent	6	Flaccid, shrunken and yellow-brown in colour. Sperm ducts enlarged and a small amount of sperm may be present.	Large, flaccid and purple in colour. A few translucent eggs may be left. Ovarian membrane very bloodshot and sac-like.
Resting	7	Firm, small and yellow-brown in colour. Sperm ducts small.	Contracted and firm, pinkish-grey to cream-yellow in colour and may appear granular in texture but no distinct eggs are visible.

APPENDIX C. Rockfish (*Sebastes* spp.) gonad condition and maturity stages.

Maturity Code	Male (testes)	Female (ovaries)
0	**Unknown**	**Unknown**
1	**Immature** - thread-like and translucent pink in colour.	**Immature** - small, translucent pink in colour.
2	**Maturing** - string-like, with slight swelling evident but still translucent.	**Maturing** - small, yellow eggs visible. Translucent or opaque.
3	**Developing** - swelling, brown-white in colour.	**Mature** - large, yellow or orange eggs. Opaque.
4	**Developed** - large, white and easily broken.	**Fertilized** – large orange-yellow eggs. Translucent.
5	**Running** – running sperm.	**Embryos or larvae** – include eyed eggs. Translucent.
6	**Spent** – white-brown in colour. Sperm still present in duct.	**Spent** - large, flaccid, red in colour. A few larvae may be present.
7	**Resting** - triangular in cross-section. Small and brown in colour.	**Resting** – moderate size, firm, orange-grey in colour. Some with dark blotches.

APPENDIX D. Tows where target species were caught but length information was not recorded as part of either length-frequency or otolith data collection.

Species	Tow	Regional Stratum	Depth Stratum
Longspine thornyhead	26	C	1201-1600 m
	31	C	1201-1600 m
	43	D	801-1200 m
	46	D	501-800 m
	67	F	1201-1600 m
Shortspine thornyhead	31	C	1201-1600 m
	43	D	801-1200 m
	67	F	1201-1600 m
	70	G	801-1200 m
Sablefish	26	C	1201-1600 m
	40	D	1201-1600 m
	43	D	801-1200 m
	51	E	1201-1600 m
Dover sole	33	C	1201-1600 m
	36	D	801-1200 m
	43	D	801-1200 m
	51	E	1201-1600 m
	61	F	801-1200 m
	65	F	501-800 m
Pectoral rattail	10	A	501-800 m
	17	B	501-800 m
	39	D	501-800 m
	42	D	801-1200 m
	43	D	801-1200 m
	44	D	501-800 m
	46	D	501-800 m
	48	E	501-800 m
	49	E	801-1200 m
	52	E	801-1200 m
	53	E	801-1200 m
	55	E	501-800 m
	56	F	501-800 m
	59	F	801-1200 m
	60	F	801-1200 m
	61	F	801-1200 m
	64	F	501-800 m
	65	F	501-800 m
	67	F	1201-1600 m
	70	G	801-1200 m
	73	G	501-800 m
Roughscale rattail	1	A	501-800 m
	10	A	501-800 m
	17	B	501-800 m
	39	D	501-800 m
	42	D	801-1200 m
	43	D	801-1200 m
	45	D	801-1200 m
	53	E	801-1200 m
	55	E	501-800 m
	60	F	801-1200 m
	61	F	801-1200 m
	64	F	501-800 m
	67	F	1201-1600 m
	74	G	501-800 m

APPENDIX E. Bridge log and haul information by tow for the 2002 Thornyhead Biomass Survey aboard the F/V Ocean Selector, September 6-23, 2002. Refer to notes at the end of this appendix to explain data fields. Species catches are sorted in decreasing order within each species group and the total weight of the entire catch is given at the bottom. Trace amounts have no weight shown.

Set :	**1**	Date: 07/09/2002
Region :	A	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 03/23
Contact (min) :	47	Duration (min) : 59
Hdline Hgt (m):	3.5	Distance (km) : 4.33
Door sprd (m):	56.0	Speed (km/h) : 4.39

	Start	Finish
Time :	8:03	9:02
Depth (m) :	647	836
Latitude :	48° 12.04'	48° 13.59'
Longitude :	125° 53.76'	125° 56.36'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	39.9
Longspine thornyhead	16.8
Flatfish	
Dover sole	19.4
Deepsea sole	0.0
Slender sole	0.0
Roundfish	
Sablefish	52.7
Pacific hake	0.9
Elasmobranchs	
Longnose skate	5.0
Brown cat shark	0.3
Miscellaneous fish	
Roughscale rattail	9.0
Pacific flatnose	3.8
Twoline eelpout	2.9
Spotted ratfish	1.7
Black eelpout	0.8
Northern lampfish	0.3
Poachers	0.1
Sand lances	0.0
Invertebrates	
Acanthonychinae	2.0
Schoolmaster gonate squid	0.9
Sea cucumber	0.1
Brittle stars	0.1
Other items	
Inanimate object(s)	0.2
TOTAL	**156.9 kg**

Set :	**2**	Date: 07/09/2002
Region :	A	Dep Zone: 501-800
Usable :	**NO**	Major/Minor : 03/23
Contact (min) :		Duration (min) :
Hdline Hgt (m):		Distance (km) :
Door sprd (m):		Speed (km/h) :

	Start	Finish
Time :	10:03	10:36
Depth (m) :		631
Latitude :	48° 14.65'	48° 14.45'
Longitude :	125° 55.70'	125° 57.24'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	19.5
Longspine thornyhead	17.8
Flatfish	
Dover sole	35.5
Deepsea sole	1.4
Roundfish	
Sablefish	13.4
Elasmobranchs	
Brown cat shark	0.9
Miscellaneous fish	
Roughscale rattail	3.5
Lumpfishes and snailfishes	1.4
Spotted ratfish	1.2
Pacific flatnose	1.0
Twoline eelpout	1.0
Melanostigmatinae	1.0
Poachers	0.1
Invertebrates	
Acanthonychinae	7.8
Spiny red sea star	1.7
Brittle stars	1.0
Starfish	1.0
Ophiuroidea	1.0
Schoolmaster gonate squid	1.0
Pacific bobtail squid	0.1
TOTAL	**111.3 kg**

Set :	**3**	Date: 07/09/2002
Region :	A	Dep Zone: 1201-1600
Usable :	**NO**	Major/Minor : 03/23
Contact (min) :		Duration (min) :
Hdline Hgt (m):		Distance (km) :
Door sprd (m):		Speed (km/h) :

	Start	Finish
Time :	12:35	13:05
Depth (m) :	1207	
Latitude :	48° 14.21'	48° 13.52'
Longitude :	126° 07.33'	126° 07.31'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	6.8
Shortspine thornyhead	2.0
Flatfish	
Deepsea sole	3.9
Dover sole	1.9
Roundfish	
Sablefish	5.3
Elasmobranchs	
Sandpaper skate	1.4
Miscellaneous fish	
Pectoral rattail	21.5
Roughscale rattail	13.8
Pacific flatnose	1.5
Twoline eelpout	0.8
Slickheads	0.4
Spotted ratfish	0.3
Black eelpout	0.2
Pacific viperfish	0.1
Poachers	0.1
Northern lampfish	0.1
Blackfin poacher	0.1
Invertebrates	
Benthoctopus	2.5
Anemone	2.0
Hermit crabs	0.1
Acanthonychinae	0.1
Gastropods	0.1
Smooth sun star	0.1
Starfish	0.1
Polychaete worms	0.1
Other items	
Inanimate object(s)	2.3
TOTAL	**67.6 kg**

Appendix E (continued)

Set :	4	Date: 07/09/2002
Region :	A	Dep Zone: 1201-1600
Usable :	**Yes**	Major/Minor : 03/23
Contact (min) :	52	Duration (min) : 60
Hdline Hgt (m):	4.7	Distance (km) : 4.69
Door sprd (m):	48.0	Speed (km/h) : 4.69

	Start	Finish
Time :	15:59	16:59
Depth (m) :	1372	
Latitude :	48° 05.49'	48° 07.06'
Longitude :	126° 06.73'	126° 08.50'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	28.6
Shortspine thornyhead	1.9
Flatfish	
Deepsea sole	19.5
Roundfish	
Sablefish	5.1
Elasmobranchs	
Abyssal skate	26.5
Sandpaper skate	0.1
Miscellaneous fish	
Roughscale rattail	180.3
Pectoral rattail	110.7
Pacific flatnose	28.1
Blob sculpin	26.4
Twoline eelpout	5.7
Graveldiver	0.5
Lumpfishes and snailfishes	0.5
Northern lampfish	0.1
Pacific viperfish	0.1
Black eelpout	0.1
Invertebrates	
Ophiuroidea	78.7
Sea cucumber	16.0
Sea whip	7.8
Tanner crabs	6.0
Coeclenterates	4.7
Anemone	4.1
Benthoctopus	3.6
Sand star	1.0
Jellyfish	0.7
Gastropods	0.1
Other items	
Inanimate object(s)	2.0
Fish eggs	0.1
TOTAL	**559.0 kg**

Set :	5	Date: 07/09/2002
Region :	A	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 03/23
Contact (min) :	82	Duration (min) : 90
Hdline Hgt (m):	3.6	Distance (km) : 6.54
Door sprd (m):	51.3	Speed (km/h) : 4.36

	Start	Finish
Time :	19:55	21:25
Depth (m) :	1052	1070
Latitude :	48° 17.52'	48° 17.41'
Longitude :	126° 11.67'	126° 07.31'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	76.3
Shortspine thornyhead	26.6
Flatfish	
Deepsea sole	12.7
Roundfish	
Sablefish	44.8
Elasmobranchs	
Roughtail skate	6.8
Sandpaper skate	0.3
Brown cat shark	0.2
Miscellaneous fish	
Roughscale rattail	466.8
Pectoral rattail	97.9
Twoline eelpout	11.7
Slickheads	9.0
Pacific flatnose	7.2
Blob sculpin	7.1
Filamented rattail	1.0
Black eelpout	0.1
Pacific viperfish	0.1
Northern lampfish	0.1
Invertebrates	
Anemone	6.6
Starfish	5.4
Benthoctopus	3.8
Sea cucumber	2.0
Lithodes couesi	1.1
Tanner crabs	0.6
Sponges	0.1
Heart urchins	0.1
Hermit crabs	0.1
Invertebrates	0.1
Other items	
Inanimate object(s)	6.2
Unidentified organic matter	1.1
TOTAL	**799.5 kg**

Set :	6	Date: 07/09/2002
Region :	A	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 03/23
Contact (min) :	71	Duration (min) : 83
Hdline Hgt (m):	4.2	Distance (km) : 6.38
Door sprd (m):	55.6	Speed (km/h) : 4.61

	Start	Finish
Time :	5:56	7:19
Depth (m) :	967	1101
Latitude :	48° 17.12'	48° 18.91'
Longitude :	126° 10.38'	126° 14.73'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	45.1
Shortspine thornyhead	6.6
Flatfish	
Deepsea sole	3.8
Roundfish	
Sablefish	37.9
Elasmobranchs	
Brown cat shark	0.3
Miscellaneous fish	
Roughscale rattail	220.7
Pectoral rattail	26.2
Slickheads	6.2
Pacific flatnose	0.8
Longfin dragonfish	0.6
Deepsea smelts	0.1
Black eelpout	0.1
Northern lampfish	0.1
Pacific viperfish	0.1
Invertebrates	
Glass sponges	3.0
Anemone	2.8
Tanner crabs	1.5
Spiny red sea star	0.5
Sand star	0.5
Ophiuroidea	0.5
Benthoctopus	0.5
Coeclenterates	0.1
Jellyfish	0.1
Shrimp	0.1
Other items	
Inanimate object(s)	1.0
Unidentified organic matter	0.1
TOTAL	**359.3 kg**

Appendix E (continued)

Set :	7	Date: 08/09/2002
Region :	A	Dep Zone: 1201-1600
Usable :	**Yes**	Major/Minor : 03/23
Contact (min) :	50	Duration (min) : 73
Hdline Hgt (m):	4.3	Distance (km) : 5.53
Door sprd (m):	57.2	Speed (km/h) : 4.55

	Start	Finish
Time :	10:04	11:17
Depth (m) :	1463	1423
Latitude :	48° 23.03'	48° 23.50'
Longitude :	126° 33.97'	126° 30.25'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	0.6
Elasmobranchs	
Abyssal skate	15.5
Miscellaneous fish	
Roughscale rattail	93.7
Pectoral rattail	78.0
Pacific flatnose	27.1
Blacktail snailfish	0.6
Unknown fish	0.6
Crested ridgehead	0.1
Northern lampfish	0.1
Slender blacksmelt	0.1
Invertebrates	
Prawn	0.5
Sea whip	0.1
Gorgonian corals	0.1
Tanner crabs	0.1
TOTAL	**217.2 kg**

Set :	8	Date: 08/09/2002
Region :	A	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 03/23
Contact (min) :	56	Duration (min) : 67
Hdline Hgt (m):	4.0	Distance (km) : 5.35
Door sprd (m):	56.3	Speed (km/h) : 4.79

	Start	Finish
Time :	13:20	14:27
Depth (m) :	1097	1152
Latitude :	48° 27.31'	48° 24.68'
Longitude :	126° 23.58'	126° 24.04'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	43.7
Shortspine thornyhead	3.1
Roundfish	
Sablefish	33.5
Elasmobranchs	
Sandpaper skate	3.7
Miscellaneous fish	
Roughscale rattail	85.7
Pectoral rattail	34.1
Pacific flatnose	2.6
Slickheads	1.7
Filamented rattail	1.0
Northern lampfish	0.1
Pacific viperfish	0.1
Slender blacksmelt	0.1
Crested ridgehead	0.1
Invertebrates	
Tanner crabs	1.3
Anemone	0.6
Squids	0.3
Jellyfish	0.2
Ophiuroidea	0.2
Gorgonian corals	0.1
Sea whip	0.1
Allocoels	0.1
Other items	
Unidentified organic matter	1.6
TOTAL	**214.0 kg**

Set :	9	Date: 08/09/2002
Region :	A	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 03/23
Contact (min) :	78	Duration (min) : 71
Hdline Hgt (m):	4.1	Distance (km) : 5.38
Door sprd (m):	54.5	Speed (km/h) : 4.55

	Start	Finish
Time :	16:12	17:23
Depth (m) :	878	805
Latitude :	48° 25.04'	48° 26.91'
Longitude :	126° 15.16'	126° 18.40'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	52.1
Shortspine thornyhead	15.8
Flatfish	
Dover sole	7.7
Deepsea sole	0.8
Roundfish	
Sablefish	5.2
Elasmobranchs	
Brown cat shark	0.2
Miscellaneous fish	
Pectoral rattail	5.8
Roughscale rattail	2.7
Twoline eelpout	1.0
Black eelpout	0.3
Lumpfishes and snailfishes	0.2
Northern lampfish	0.1
Stout blacksmelt	0.1
Slender barracudina	0.1
Slickheads	0.1
Sand lances	0.1
Blackfin poacher	0.1
Pacific viperfish	0.1
Invertebrates	
Squids	0.5
Tanner crabs	0.5
Sand star	0.1
Ophiuroidea	0.1
Red king crab	0.1
Lithodes couesi	0.1
Other items	
Inanimate object(s)	0.6
TOTAL	**94.5 kg**

Appendix E (continued)

Set :	10	Date: 08/09/2002
Region :	A	Dep Zone: 501-800
Usable :	Yes	Major/Minor : 03/23
Contact (min) :	81	Duration (min) : 81
Hdline Hgt (m):	4.1	Distance (km) : 5.85
Door sprd (m):	57.0	Speed (km/h) : 4.34

	Start	Finish
Time :	18:56	20:17
Depth (m) :	732	732
Latitude :	48° 26.58'	48° 29.44'
Longitude :	126° 15.45'	126° 16.45'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	35.5
Longspine thornyhead	26.3
Flatfish	
Dover sole	21.5
Roundfish	
Sablefish	30.4
Elasmobranchs	
Brown cat shark	3.3
Miscellaneous fish	
Roughscale rattail	5.1
Slickheads	1.2
Twoline eelpout	0.7
Black eelpout	0.5
Pectoral rattail	0.5
Pacific flatnose	0.3
Northern lampfish	0.2
Sand lances	0.1
Pacific viperfish	0.1
Longfin dragonfish	0.1
Deepsea smelts	0.1
Invertebrates	
Tanner crabs	10.7
Cirrata	1.4
Schoolmaster gonate squid	0.7
Spiny red sea star	0.5
Coeclenterates	0.1
Squids	0.1
TOTAL	**139.4 kg**

Set :	11	Date: 08/09/2002
Region :	A	Dep Zone: 501-800
Usable :	Yes	Major/Minor : 03/23
Contact (min) :	69	Duration (min) : 63
Hdline Hgt (m):	4.2	Distance (km) : 4.80
Door sprd (m):	55.1	Speed (km/h) : 4.57

	Start	Finish
Time :	21:22	22:25
Depth (m) :	695	700
Latitude :	48° 30.94'	48° 28.35'
Longitude :	126° 14.36'	126° 15.32'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	38.0
Longspine thornyhead	11.1
Flatfish	
Dover sole	23.4
Roundfish	
Sablefish	125.1
Elasmobranchs	
Brown cat shark	1.0
Miscellaneous fish	
Pectoral rattail	23.8
Roughscale rattail	5.3
Pacific flatnose	4.6
Twoline eelpout	4.2
Northern lampfish	0.5
Rockweed gunnel	0.1
Pacific viperfish	0.1
Invertebrates	
Tanner crabs	4.4
Schoolmaster gonate squid	4.3
Anemone	1.3
Benthoctopus	0.5
Jellyfish	0.1
Squids	0.1
Sand star	0.1
Lithodes couesi	0.1
TOTAL	**248.1 kg**

Set :	12	Date: 09/09/2002
Region :	A	Dep Zone: 501-800
Usable :	Yes	Major/Minor : 03/23
Contact (min) :	69	Duration (min) : 67
Hdline Hgt (m):	4.0	Distance (km) : 5.59
Door sprd (m):	56.4	Speed (km/h) : 5.01

	Start	Finish
Time :	5:40	6:47
Depth (m) :	726	699
Latitude :	48° 32.34'	48° 29.34'
Longitude :	126° 16.60'	126° 15.91'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	81.7
Longspine thornyhead	44.1
Flatfish	
Dover sole	42.6
Deepsea sole	0.1
Roundfish	
Sablefish	100.7
Elasmobranchs	
Brown cat shark	3.1
Miscellaneous fish	
Pectoral rattail	18.3
Roughscale rattail	6.4
Twoline eelpout	1.5
Pacific flatnose	0.7
Pacific viperfish	0.5
Deepsea smelts	0.5
Northern lampfish	0.5
Black eelpout	0.1
Blacktail snailfish	0.1
Invertebrates	
Tanner crabs	12.2
Schoolmaster gonate squid	3.8
Starfish	0.5
Anemone	0.1
Prawn	0.1
Octopus	0.1
Squids	0.1
Other items	
Unidentified organic matter	0.5
Inanimate object(s)	0.5
TOTAL	**318.8 kg**

Appendix E (continued)

Set :	13	Date: 09/09/2002
Region :	B	Dep Zone: 801-1200
Usable :	Yes	Major/Minor : 03/23
Contact (min) :	60	Duration (min) : 62
Hdline Hgt (m):	3.9	Distance (km) : 4.51
Door sprd (m):	56.5	Speed (km/h) : 4.36

	Start	Finish
Time :	9:45	10:47
Depth (m) :	885	914
Latitude :	48° 34.89'	48° 37.14'
Longitude :	126° 22.22'	126° 23.77'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	106.6
Shortspine thornyhead	20.3
Flatfish	
Dover sole	23.2
Deepsea sole	1.1
Roundfish	
Sablefish	16.5
Elasmobranchs	
Brown cat shark	0.2
Miscellaneous fish	
Roughscale rattail	10.2
Pectoral rattail	4.2
Twoline eelpout	0.8
Deepsea smelts	0.1
Longfin dragonfish	0.1
Northern lampfish	0.1
Slickheads	0.1
Filamented rattail	0.1
Crested ridgehead	0.1
Pacific viperfish	0.1
Invertebrates	
Tanner crabs	6.8
Cirrata	0.7
Jellyfish	0.1
Prawn	0.1
Pedunculate barnacles	0.1
Squids	0.1
Other items	
Unidentified organic matter	2.4
Inanimate object(s)	0.4
TOTAL	**194.5 kg**

Set :	14	Date: 09/09/2002
Region :	B	Dep Zone: 501-800
Usable :	Yes	Major/Minor : 03/23
Contact (min) :	57	Duration (min) : 70
Hdline Hgt (m):	4.0	Distance (km) : 6.07
Door sprd (m):	54.3	Speed (km/h) : 5.20

	Start	Finish
Time :	13:09	14:19
Depth (m) :	622	
Latitude :	48° 38.71'	48° 41.36'
Longitude :	126° 19.50'	126° 19.25'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	132.1
Shortraker rockfish	72.9
Longspine thornyhead	30.9
Flatfish	
Dover sole	90.2
Deepsea sole	3.3
Rex sole	1.0
Slender sole	0.6
Roundfish	
Sablefish	71.4
Pacific hake	13.1
Elasmobranchs	
Longnose skate	9.3
Sandpaper skate	1.4
Brown cat shark	0.5
Miscellaneous fish	
Pectoral rattail	10.2
Pacific flatnose	4.9
Roughscale rattail	1.0
Twoline eelpout	0.5
Black eelpout	0.5
Northern lampfish	0.1
Longfin dragonfish	0.1
Blacktail snailfish	0.1
Invertebrates	
Schoolmaster gonate squid	11.9
Tanner crabs	0.9
Sponges	0.5
Squids	0.5
Starfish	0.5
Spiny red sea star	0.5
Octopus	0.5
Jellyfish	0.1
Sea whip	0.1
Shrimp	0.1
TOTAL	**459.7 kg**

Set :	15	Date: 09/09/2002
Region :	B	Dep Zone: 501-800
Usable :	Yes	Major/Minor : 03/24
Contact (min) :	82	Duration (min) : 77
Hdline Hgt (m):	4.2	Distance (km) : 6.66
Door sprd (m):	50.2	Speed (km/h) : 5.19

	Start	Finish
Time :	16:09	17:26
Depth (m) :	728	691
Latitude :	48° 41.36'	48° 43.71'
Longitude :	126° 30.02'	126° 33.87'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	50.5
Longspine thornyhead	37.3
Flatfish	
Dover sole	33.3
Deepsea sole	2.5
Rex sole	0.2
Roundfish	
Sablefish	96.9
Pacific hake	0.8
Elasmobranchs	
Roughtail skate	5.6
Brown cat shark	0.2
Miscellaneous fish	
Pectoral rattail	8.8
Roughscale rattail	6.0
Pacific flatnose	3.6
Twoline eelpout	1.7
Black eelpout	0.5
Filamented rattail	0.1
Northern lampfish	0.1
Pacific viperfish	0.1
Longfin dragonfish	0.1
Deepsea smelts	0.1
Invertebrates	
Schoolmaster gonate squid	3.3
Tanner crabs	2.6
Anemone	0.5
Spiny red sea star	0.5
Cirrata	0.5
Squids	0.1
Shrimp	0.1
TOTAL	**256.0 kg**

Appendix E (continued)

Set :	16	Date: 09/09/2002
Region :	B	Dep Zone: 801-1200
Usable :	**NO**	Major/Minor : 03/24
Contact (min) :		Duration (min) :
Hdline Hgt (m):		Distance (km) :
Door sprd (m):		Speed (km/h) :

	Start	Finish
Time :	19:18	19:28
Depth (m) :	947	
Latitude :	48° 40.00'	48° 40.81'
Longitude :	126° 31.00'	126° 31.94'

** Catch was not sampled **

Set :	17	Date: 10/09/2002
Region :	B	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 03/24
Contact (min) :	65	Duration (min) : 68
Hdline Hgt (m):	4.0	Distance (km) : 5.06
Door sprd (m):	58.5	Speed (km/h) : 4.47

	Start	Finish
Time :	5:38	6:46
Depth (m) :	558	635
Latitude :	48° 46.29'	48° 47.87'
Longitude :	126° 35.89'	126° 38.67'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	39.5
Longspine thornyhead	13.6
Shortraker rockfish	2.6
Flatfish	
Dover sole	52.9
Roundfish	
Sablefish	43.1
Pacific hake	0.5
Miscellaneous fish	
Pectoral rattail	17.9
Pacific flatnose	4.2
Roughscale rattail	0.5
Twoline eelpout	0.5
Black eelpout	0.4
Northern lampfish	0.2
Pacific viperfish	0.1
Deepsea smelts	0.1
Snipe eels	0.1
Invertebrates	
Tanner crabs	5.5
Squids	1.5
Schoolmaster gonate squid	1.4
Cirrata	0.5
Anemone	0.1
Sand star	0.1
Starfish	0.1
Shrimp	0.1
Other items	
Inanimate object(s)	0.3
TOTAL	**185.8 kg**

Set :	18	Date: 10/09/2002
Region :	B	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 03/24
Contact (min) :	51	Duration (min) : 65
Hdline Hgt (m):	4.0	Distance (km) : 4.72
Door sprd (m):	57.0	Speed (km/h) : 4.36

	Start	Finish
Time :	8:06	9:11
Depth (m) :	969	1000
Latitude :	48° 49.98'	48° 47.55'
Longitude :	126° 41.45'	126° 40.98'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	56.0
Shortspine thornyhead	10.7
Flatfish	
Dover sole	3.4
Deepsea sole	0.2
Roundfish	
Sablefish	47.2
Miscellaneous fish	
Pectoral rattail	24.1
Roughscale rattail	17.6
Twoline eelpout	2.1
Slickheads	1.7
Northern lampfish	0.1
Pacific viperfish	0.1
Longfin dragonfish	0.1
Pacific flatnose	0.1
Invertebrates	
Tanner crabs	9.5
Schoolmaster gonate squid	2.2
Squids	0.2
Other items	
Inanimate object(s)	0.5
TOTAL	**175.8 kg**

Appendix E (continued)

Set :	19	Date: 10/09/2002
Region :	B	Dep Zone: 1201-1600
Usable :	NO	Major/Minor : 03/24
Contact (min) :		Duration (min) :
Hdline Hgt (m):		Distance (km) :
Door sprd (m):		Speed (km/h) :

	Start	Finish
Time :	11:29	11:44
Depth (m) :	1353	
Latitude :	48° 44.41'	48° 44.75'
Longitude :	126° 46.84'	126° 46.75'

** Catch was not sampled **

Set :	20	Date: 10/09/2002
Region :	B	Dep Zone: 1201-1600
Usable :	Yes	Major/Minor : 03/24
Contact (min) :	75	Duration (min) : 92
Hdline Hgt (m):	4.1	Distance (km) : 6.87
Door sprd (m):	58.6	Speed (km/h) : 4.48

	Start	Finish
Time :	13:58	15:30
Depth (m) :	1390	1317
Latitude :	48° 44.87'	48° 42.01'
Longitude :	126° 46.79'	126° 44.25'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	18.4
Shortspine thornyhead	1.9
Flatfish	
Deepsea sole	0.4
Roundfish	
Sablefish	9.3
Elasmobranchs	
Abyssal skate	11.8
Sandpaper skate	7.6
Miscellaneous fish	
Roughscale rattail	145.7
Pectoral rattail	113.3
Pacific flatnose	11.6
Filamented rattail	1.3
Deepsea smelts	0.6
Northern lampfish	0.5
Twoline eelpout	0.5
Pacific viperfish	0.4
Black eelpout	0.2
Longfin dragonfish	0.2
Crested ridgehead	0.1
Slickheads	0.1
Invertebrates	
Tanner crabs	2.5
Ophiuroidea	1.0
Sea whip	0.8
Squids	0.4
Allocoels	0.3
Sea cucumber	0.1
Jellyfish	0.1
Prawn	0.1
Other items	
Unidentified organic matter	0.1
TOTAL	**329.3 kg**

Set :	21	Date: 10/09/2002
Region :	B	Dep Zone: 801-1200
Usable :	Yes	Major/Minor : 03/24
Contact (min) :	78	Duration (min) : 91
Hdline Hgt (m):	5.2	Distance (km) : 6.54
Door sprd (m):	57.1	Speed (km/h) : 4.31

	Start	Finish
Time :	17:27	18:58
Depth (m) :	951	905
Latitude :	48° 42.02'	48° 40.49'
Longitude :	126° 34.03'	126° 29.66'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	184.8
Shortspine thornyhead	35.4
Flatfish	
Deepsea sole	5.4
Dover sole	0.7
Roundfish	
Sablefish	32.5
Elasmobranchs	
Brown cat shark	0.1
Miscellaneous fish	
Pectoral rattail	30.9
Roughscale rattail	26.4
Slickheads	1.7
Northern lampfish	0.7
Twoline eelpout	0.5
Lumpfishes and snailfishes	0.2
Pacific viperfish	0.2
Pacific hagfish	0.1
Filamented rattail	0.1
Invertebrates	
Tanner crabs	5.2
Lithodes couesi	0.7
Schoolmaster gonate squid	0.5
Ophiuroidea	0.5
Cirrata	0.5
Anemone	0.1
Sea whip	0.1
Sand star	0.1
Jellyfish	0.1
TOTAL	**327.5 kg**

Appendix E (continued)

Set :	22	Date: 11/09/2002
Region :	B	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 03/23
Contact (min) :	109	Duration (min) : 116
Hdline Hgt (m):	4.1	Distance (km) : 9.55
Door sprd (m):	55.9	Speed (km/h) : 4.94

	Start	Finish
Time :	6:39	8:35
Depth (m) :	684	768
Latitude :	48° 36.65'	48° 34.13'
Longitude :	126° 16.68'	126° 19.76'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	175.2
Longspine thornyhead	118.6
Flatfish	
Dover sole	92.1
Deepsea sole	8.3
Roundfish	
Sablefish	135.1
Elasmobranchs	
Longnose skate	6.9
Brown cat shark	0.7
Miscellaneous fish	
Pectoral rattail	7.0
Roughscale rattail	5.5
Pacific flatnose	3.3
Black eelpout	0.9
Deepsea smelts	0.5
Twoline eelpout	0.5
Filamented rattail	0.5
Pacific viperfish	0.1
Northern lampfish	0.1
Invertebrates	
Schoolmaster gonate squid	10.8
Tanner crabs	8.1
Glass sponges	2.8
Sand star	1.1
Starfish	0.7
Lithodes couesi	0.5
Benthoctopus	0.5
Sea cucumber	0.1
Gastropods	0.1
Squids	0.1
Pacific bobtail squid	0.1
Red king crab	0.1
Other items	
Unidentified organic matter	1.5
TOTAL	**581.8 kg**

Set :	23	Date: 11/09/2002
Region :	B	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 03/23
Contact (min) :	73	Duration (min) : 80
Hdline Hgt (m):	3.2	Distance (km) : 5.64
Door sprd (m):	60.2	Speed (km/h) : 4.20

	Start	Finish
Time :	10:20	11:40
Depth (m) :	1079	1094
Latitude :	48° 34.28'	48° 25.83'
Longitude :	126° 25.71'	126° 25.88'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	84.5
Shortspine thornyhead	14.7
Flatfish	
Deepsea sole	0.1
Roundfish	
Sablefish	59.0
Elasmobranchs	
Roughtail skate	6.5
Miscellaneous fish	
Roughscale rattail	116.3
Pectoral rattail	30.1
Slickheads	7.5
Pacific flatnose	2.2
Twoline eelpout	1.1
Pacific viperfish	0.1
Deepsea smelts	0.1
Crested ridgehead	0.1
Invertebrates	
Tanner crabs	27.9
Anemone	2.5
Starfish	0.5
Sand star	0.5
Octopus	0.5
Squids	0.5
Sea whip	0.1
Jellyfish	0.1
Other items	
Unidentified organic matter	0.6
TOTAL	**355.5 kg**

Set :	24	Date: 11/09/2002
Region :	B	Dep Zone: 1201-1600
Usable :	**Yes**	Major/Minor : 03/24
Contact (min) :	65	Duration (min) : 70
Hdline Hgt (m):	4.1	Distance (km) : 4.59
Door sprd (m):	54.6	Speed (km/h) : 3.93

	Start	Finish
Time :	14:57	16:07
Depth (m) :	1417	1436
Latitude :	48° 29.20'	48° 37.15'
Longitude :	126° 44.14'	126° 44.16'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	8.2
Rougheye rockfish	2.0
Flatfish	
Deepsea sole	4.0
Roundfish	
Sablefish	7.7
Elasmobranchs	
Roughtail skate	4.8
Miscellaneous fish	
Pectoral rattail	182.8
Roughscale rattail	76.6
Pacific flatnose	15.5
Filamented rattail	1.0
Deepsea smelts	0.3
Pacific viperfish	0.1
Crested ridgehead	0.1
Invertebrates	
Ophiuroidea	7.0
Sea whip	1.5
Tanner crabs	1.1
Sand star	0.6
Prawn	0.2
Squids	0.1
Sea cucumber	0.1
Coeclenterates	0.1
Anemone	0.1
Polychaete worms	0.1
Sponges	0.1
TOTAL	**314.1 kg**

Appendix E (continued)

Set :	25	Date: 11/09/2002
Region :	C	Dep Zone: 1201-1600
Usable :	**NO**	Major/Minor : 03/24
Contact (min) :		Duration (min) :
Hdline Hgt (m):		Distance (km) :
Door sprd (m):		Speed (km/h) :

	Start	Finish
Time :	19:35	19:53
Depth (m) :	1390	1390
Latitude :	48° 46.46'	48° 46.06'
Longitude :	126° 51.85'	126° 51.19'

** Catch was not sampled **

Set :	26	Date: 11/09/2002
Region :	C	Dep Zone: 1201-1600
Usable :	**Yes**	Major/Minor : 03/24
Contact (min) :	55	Duration (min) : 72
Hdline Hgt (m):	3.8	Distance (km) : 4.96
Door sprd (m):	57.3	Speed (km/h) : 4.13

	Start	Finish
Time :	21:17	22:29
Depth (m) :	1399	1390
Latitude :	48° 44.51'	48° 46.95'
Longitude :	126° 53.07'	126° 51.69'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	3.7
Flatfish	
Deepsea sole	1.1
Roundfish	
Sablefish	1.5
Elasmobranchs	
Abyssal skate	11.8
Miscellaneous fish	
Roughscale rattail	153.8
Pectoral rattail	90.7
Pacific flatnose	27.9
Blacktail snailfish	1.0
Black eelpout	0.5
Northern lampfish	0.2
Deepsea smelts	0.2
Longfin dragonfish	0.1
Slender barracudina	0.1
Crested ridgehead	0.1
Pacific viperfish	0.1
Invertebrates	
Ophiuroidea	78.1
Sea whip	23.5
True crabs	1.5
Squids	1.0
Sand sta	0.8
Anemone	0.6
Tanner crabs	0.4
Gorgonian corals	0.1
Other items	
Inanimate object(s)	2.0
TOTAL	**400.8 kg**

Set :	27	Date: 12/09/2002
Region :	C	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 03/24
Contact (min) :	90	Duration (min) : 92
Hdline Hgt (m):	3.8	Distance (km) : 8.67
Door sprd (m):	55.4	Speed (km/h) : 5.65

	Start	Finish
Time :	6:27	7:59
Depth (m) :	622	640
Latitude :	48° 53.58'	48° 55.21'
Longitude :	126° 38.56'	126° 44.20'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	56.8
Longspine thornyhead	20.3
Flatfish	
Dover sole	24.5
Arrowtooth flounder	2.2
Roundfish	
Sablefish	251.2
Elasmobranchs	
Longnose skate	4.1
Roughtail skate	3.8
Miscellaneous fish	
Pectoral rattail	32.4
Pacific flatnose	10.9
Roughscale rattail	10.3
Twoline eelpout	2.2
Black eelpout	1.8
Blacktail snailfish	0.2
Northern lampfish	0.2
Pacific viperfish	0.1
Poachers	0.1
Longfin dragonfish	0.1
Sauries	0.1
Sand lances	0.1
Invertebrates	
Schoolmaster gonate squid	22.2
Tanner crabs	21.5
Anemone	2.1
Squids	0.5
Spiny red sea star	0.1
Jellyfish	0.1
Shrimp	0.1
Gastropods	0.1
Other items	
Inanimate object(s)	0.5
TOTAL	**468.6 kg**

Appendix E (continued)

Set :	28	Date: 12/09/2002
Region :	C	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 03/24
Contact (min) :	66	Duration (min) : 82
Hdline Hgt (m):	4.0	Distance (km) : 5.92
Door sprd (m):	56.7	Speed (km/h) : 4.33

	Start	Finish
Time :	9:42	11:04
Depth (m) :	951	924
Latitude :	48° 54.92'	48° 57.93'
Longitude :	126° 55.08'	126° 57.11'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	67.1
Shortspine thornyhead	12.0
Flatfish	
Deepsea sole	0.3
Roundfish	
Sablefish	40.4
Miscellaneous fish	
Pectoral rattail	14.7
Roughscale rattail	3.9
Black eelpout	0.5
Slickheads	0.5
Longfin dragonfish	0.4
Pacific flatnose	0.4
Deepsea smelts	0.2
Lanternfishes	0.1
Pacific viperfish	0.1
Northern lampfish	0.1
Invertebrates	
Tanner crabs	7.5
Cirrata	2.5
Schoolmaster gonate squid	0.5
Starfish	0.5
Gastropods	0.1
TOTAL	**151.8 kg**

Set :	29	Date: 12/09/2002
Region :	C	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 03/24
Contact (min) :	74	Duration (min) : 89
Hdline Hgt (m):	3.7	Distance (km) : 6.78
Door sprd (m):	55.4	Speed (km/h) : 4.57

	Start	Finish
Time :	12:36	14:05
Depth (m) :	1116	1097
Latitude :	48° 57.82'	49° 00.92'
Longitude :	126° 59.42'	127° 00.92'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	68.7
Shortspine thornyhead	1.8
Flatfish	
Deepsea sole	2.8
Roundfish	
Sablefish	2.7
Elasmobranchs	
Roughtail skate	10.9
Miscellaneous fish	
Roughscale rattail	227.8
Pectoral rattail	43.5
Pacific flatnose	6.7
Slickheads	1.6
Twoline eelpout	0.8
Northern lampfish	0.5
Deepsea smelts	0.5
Black eelpout	0.5
Filamented rattail	0.2
Pacific viperfish	0.1
Longfin dragonfish	0.1
Invertebrates	
Tanner crabs	29.1
Anemone	9.4
Starfish	1.1
Squids	1.0
Jellyfish	0.1
Gastropods	0.1
Other items	
Unidentified organic matter	0.8
Inanimate object(s)	0.6
TOTAL	**411.4 kg**

Set :	30	Date: 12/09/2002
Region :	C	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 03/24
Contact (min) :	74	Duration (min) : 81
Hdline Hgt (m):	3.8	Distance (km) : 5.50
Door sprd (m):	54.6	Speed (km/h) : 4.09

	Start	Finish
Time :	15:49	17:10
Depth (m) :	1161	1024
Latitude :	48° 54.96'	48° 53.28'
Longitude :	126° 59.50'	126° 56.18'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	56.8
Shortspine thornyhead	14.4
Flatfish	
Deepsea sole	5.9
Dover sole	3.1
Roundfish	
Sablefish	32.7
Elasmobranchs	
Roughtail skate	15.3
Miscellaneous fish	
Roughscale rattail	133.3
Pectoral rattail	24.0
Slickheads	13.2
Pacific flatnose	4.1
Filamented rattail	0.5
Twoline eelpout	0.5
Deepsea smelts	0.3
Longfin dragonfish	0.2
Northern lampfish	0.2
Pacific viperfish	0.1
Invertebrates	
Tanner crabs	11.1
Anemone	10.2
Benthoctopus	2.3
Glass sponges	0.7
Starfish	0.4
Squids	0.2
Sea whip	0.1
Sponges	0.1
Jellyfish	0.1
Other items	
Unidentified organic matter	1.3
TOTAL	**331.1 kg**

Appendix E (continued)

Set :	31	Date: 12/09/2002
Region :	C	Dep Zone: 1201-1600
Usable :	**Yes**	Major/Minor : 03/24
Contact (min) :	78	Duration (min) : 87
Hdline Hgt (m):	3.6	Distance (km) : 6.67
Door sprd (m):	56.4	Speed (km/h) : 4.60

	Start	Finish
Time :	18:47	20:14
Depth (m) :	1426	1317
Latitude :	48° 50.03'	48° 52.78'
Longitude :	126° 57.24'	126° 58.37'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	3.7
Longspine thornyhead	3.2
Flatfish	
Deepsea sole	3.7
Miscellaneous fish	
Pectoral rattail	160.2
Roughscale rattail	156.5
Pacific flatnose	40.2
Deepsea smelts	0.4
Northern lampfish	0.4
Pacific viperfish	0.1
Crested ridgehead	0.1
Longfin dragonfish	0.1
Invertebrates	
Ophiuroidea	100.9
Sea whip	16.1
Anemone	3.5
Starfish	2.5
Sea cucumber	0.5
Squids	0.5
Glass sponges	0.4
Tanner crabs	0.4
Prawn	0.3
Red king crab	0.2
Gastropods	0.1
Jellyfish	0.1
Polychaete worms	0.1
Other items	
Unidentified organic matter	4.3
Fish eggs	0.2
TOTAL	**498.7 kg**

Set :	32	Date: 13/09/2002
Region :	C	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	63	Duration (min) : 96
Hdline Hgt (m):	4.0	Distance (km) : 8.97
Door sprd (m):	57.4	Speed (km/h) : 5.61

	Start	Finish
Time :	6:35	8:11
Depth (m) :	561	594
Latitude :	49° 03.77'	49° 08.12'
Longitude :	126° 57.60'	127° 00.70

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	22.2
Longspine thornyhead	3.8
Aurora rockfish	0.4
Flatfish	
Dover sole	60.2
Rex sole	0.8
Roundfish	
Sablefish	58.4
Pacific hake	15.8
Miscellaneous fish	
Black eelpout	3.5
Pacific flatnose	2.8
Invertebrates	
Schoolmaster gonate squid	12.0
Tanner crabs	3.1
TOTAL	**183.0 kg**

Set :	33	Date: 13/09/2002
Region :	C	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	69	Duration (min) : 89
Hdline Hgt (m):	3.8	Distance (km) : 6.95
Door sprd (m):	57.3	Speed (km/h) : 4.69

	Start	Finish
Time :	9:57	11:26
Depth (m) :	989	1101
Latitude :	49° 03.99'	49° 05.56'
Longitude :	127° 01.64'	127° 06.45'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	144.1
Shortspine thornyhead	12.9
Flatfish	
Deepsea sole	3.0
Dover sole	1.3
Roundfish	
Sablefish	30.5
Elasmobranchs	
Roughtail skate	4.2
Miscellaneous fish	
Roughscale rattail	176.0
Pectoral rattail	50.1
Slickheads	13.2
Twoline eelpout	5.6
Pacific flatnose	3.6
Black eelpout	0.4
Northern lampfish	0.1
Deepsea smelts	0.1
Invertebrates	
Tanner crabs	21.2
Anemone	5.3
Schoolmaster gonate squid	2.4
Sea cucumber	0.3
Glass sponges	0.3
Starfish	0.2
Spiny red sea star	0.1
Other items	
Inanimate object(s)	1.6
Unidentified organic matter	0.1
TOTAL	**476.6 kg**

Appendix E (continued)

Set :	34	Date: 13/09/2002
Region :	C	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	80	Duration (min) : 81
Hdline Hgt (m):	3.7	Distance (km) : 6.34
Door sprd (m):	59.0	Speed (km/h) : 4.70

	Start	Finish
Time :	12:53	14:14
Depth (m) :	732	732
Latitude :	49° 08.93'	49° 11.83'
Longitude :	127° 04.85'	127° 07.34'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	83.7
Longspine thornyhead	34.6
Flatfish	
Dover sole	20.2
Deepsea sole	1.7
Roundfish	
Sablefish	124.2
Elasmobranchs	
Roughtail skate	2.5
Brown cat shark	0.4
Miscellaneous fish	
Pectoral rattail	19.5
Roughscale rattail	6.7
Black eelpout	1.2
Filamented rattail	0.7
Pacific flatnose	0.1
Poachers	0.1
Invertebrates	
Schoolmaster gonate squid	16.3
Tanner crabs	5.6
Anemone	0.5
Cirrata	0.5
Starfish	0.3
TOTAL	**318.8 kg**

Set :	35	Date: 13/09/2002
Region :	C	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	65	Duration (min) : 72
Hdline Hgt (m):	3.9	Distance (km) : 5.12
Door sprd (m):	59.5	Speed (km/h) : 4.26

	Start	Finish
Time :	15:14	16:26
Depth (m) :	658	640
Latitude :	49° 12.16'	49° 09.86'
Longitude :	127° 06.85'	127° 04.68'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	29.6
Longspine thornyhead	12.7
Flatfish	
Dover sole	45.6
Roundfish	
Sablefish	85.7
Elasmobranchs	
Longnose skate	6.6
Roughtail skate	1.4
Brown cat shark	1.0
Miscellaneous fish	
Pectoral rattail	34.5
Pacific flatnose	3.2
Twoline eelpout	1.8
Black eelpout	0.7
Roughscale rattail	0.3
Invertebrates	
Tanner crabs	7.8
Schoolmaster gonate squid	6.5
Gastropods	0.1
Other items	
Inanimate object(s)	6.0
TOTAL	**243.5 kg**

Set :	36	Date: 13/09/2002
Region :	D	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	92	Duration (min) : 104
Hdline Hgt (m):	4.9	Distance (km) : 7.54
Door sprd (m):	57.0	Speed (km/h) : 4.35

	Start	Finish
Time :	17:49	19:33
Depth (m) :	1006	951
Latitude :	49° 14.16'	49° 17.43'
Longitude :	127° 10.11'	127° 13.49'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	233.6
Shortspine thornyhead	35.3
Flatfish	
Deepsea sole	2.3
Dover sole	1.2
Roundfish	
Sablefish	53.1
Elasmobranchs	
Longnose skate	5.1
Roughtail skate	3.5
Miscellaneous fish	
Roughscale rattail	107.5
Pectoral rattail	31.3
Filamented rattail	3.1
Twoline eelpout	1.8
Pacific flatnose	1.6
Slickheads	1.3
Black eelpout	0.8
Northern lampfish	0.1
Pacific viperfish	0.1
Deepsea smelts	0.1
Invertebrates	
Tanner crabs	12.2
Cirrata	0.7
Schoolmaster gonate squid	0.7
Squids	0.1
Sponges	0.1
Jellyfish	0.1
Sea cucumber	0.1
Coeclenterates	0.1
Heart urchins	0.1
Shrimp	0.1
TOTAL	**496.1 kg**

Appendix E (continued)

Set :	37	Date: 14/09/2002
Region :	D	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	123	Duration (min) : 136
Hdline Hgt (m):	4.8	Distance (km) : 9.47
Door sprd (m):	58.1	Speed (km/h) : 4.18

	Start	Finish
Time :	6:36	8:52
Depth (m) :	1061	988
Latitude :	49° 15.56'	49° 19.74'
Longitude :	127° 12.06'	127° 16.51'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	231.8
Shortspine thornyhead	29.6
Flatfish	
Deepsea sole	4.8
Roundfish	
Sablefish	43.4
Elasmobranchs	
Roughtail skate	6.3
Brown cat shark	0.1
Miscellaneous fish	
Roughscale rattail	420.3
Pectoral rattail	63.4
Pacific flatnose	6.5
Slickheads	6.2
Twoline eelpout	4.3
Filamented rattail	1.6
Black eelpout	0.5
Pacific viperfish	0.1
Deepsea smelts	0.1
Invertebrates	
Tanner crabs	15.2
Starfish	1.5
Gastropods	0.6
Anemone	0.5
Jellyfish	0.1
Other items	
Inanimate object(s)	1.0
TOTAL	**837.9 kg**

Set :	38	Date: 14/09/2002
Region :	D	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	65	Duration (min) : 80
Hdline Hgt (m):	3.7	Distance (km) : 6.28
Door sprd (m):	59.8	Speed (km/h) : 4.71

	Start	Finish
Time :	10:30	11:50
Depth (m) :	605	618
Latitude :	49° 16.95'	49° 19.58'
Longitude :	127° 10.73'	127° 13.79'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	33.1
Longspine thornyhead	9.0
Flatfish	
Dover sole	89.8
Deepsea sole	0.5
Roundfish	
Sablefish	79.9
Elasmobranchs	
Brown cat shark	0.3
Miscellaneous fish	
Pacific flatnose	9.2
Black eelpout	1.0
Deepsea smelts	0.1
Northern lampfish	0.1
Invertebrates	
Schoolmaster gonate squid	15.2
Tanner crabs	2.3
Squids	1.0
Benthoctopus	1.0
Starfish	0.5
Jellyfish	0.1
TOTAL	**243.1 kg**

Set :	39	Date: 14/09/2002
Region :	D	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	67	Duration (min) : 72
Hdline Hgt (m):	3.8	Distance (km) : 5.43
Door sprd (m):	56.8	Speed (km/h) : 4.53

	Start	Finish
Time :	13:13	14:25
Depth (m) :	585	768
Latitude :	49° 24.37'	49° 21.60'
Longitude :	127° 17.89'	127° 17.67'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	68.4
Longspine thornyhead	15.2
Shortraker rockfish	3.9
Flatfish	
Dover sole	51.5
Deepsea sole	0.7
Roundfish	
Sablefish	25.0
Elasmobranchs	
Longnose skate	5.6
Miscellaneous fish	
Pacific flatnose	4.1
Pectoral rattail	3.1
Roughscale rattail	0.4
Twoline eelpout	0.2
Northern lampfish	0.1
Invertebrates	
Schoolmaster gonate squid	7.9
Cirrata	0.5
Squids	0.2
Starfish	0.1
TOTAL	**186.9 kg**

Appendix E (continued)

Set :	40	Date: 14/09/2002
Region :	D	Dep Zone: 1201-1600
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	76	Duration (min) : 84
Hdline Hgt (m):	3.8	Distance (km) : 6.15
Door sprd (m):	57.7	Speed (km/h) : 4.39

	Start	Finish
Time :	16:41	18:05
Depth (m) :	1286	1280
Latitude :	49° 22.70'	49° 20.16'
Longitude :	127° 24.19'	127° 21.42'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	34.1
Shortspine thornyhead	7.6
Flatfish	
Deepsea sole	0.6
Roundfish	
Sablefish	12.2
Elasmobranchs	
Abyssal skate	8.7
Miscellaneous fish	
Roughscale rattail	171.4
Pectoral rattail	101.5
Pacific flatnose	25.8
Filamented rattail	1.0
Deepsea smelts	0.8
Black eelpout	0.3
Sand lances	0.1
Crested ridgehead	0.1
Northern lampfish	0.1
Pacific viperfish	0.1
Invertebrates	
Tanner crabs	11.5
Anemone	9.4
Ophiuroidea	5.3
Starfish	1.2
Sea whip	1.0
Squids	0.1
Other items	
Fish eggs	0.1
TOTAL	**393.0 kg**

Set :	41	Date: 15/09/2002
Region :	D	Dep Zone: 1201-1600
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	74	Duration (min) : 87
Hdline Hgt (m):	3.8	Distance (km) : 6.04
Door sprd (m):	56.6	Speed (km/h) : 4.16

	Start	Finish
Time :	6:48	8:15
Depth (m) :	1289	1454
Latitude :	49° 14.06'	49° 12.37'
Longitude :	127° 16.08'	127° 12.25'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	7.6
Flatfish	
Deepsea sole	2.2
Roundfish	
Sablefish	20.3
Elasmobranchs	
Abyssal skate	11.9
Roughtail skate	3.3
Miscellaneous fish	
Pectoral rattail	251.4
Roughscale rattail	182.3
Pacific flatnose	34.1
Filamented rattail	8.9
Twoline eelpout	1.3
Deepsea smelts	0.3
Pacific viperfish	0.1
Invertebrates	
Echinoidea	37.5
Sea whip	14.1
Anemone	6.7
Tanner crabs	1.9
Starfish	1.7
Schoolmaster gonate squid	0.7
Jellyfish	0.1
Sea cucumber	0.1
Prawn	0.1
Other items	
Inanimate object(s)	2.6
TOTAL	**589.2 kg**

Set :	42	Date: 15/09/2002
Region :	D	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	83	Duration (min) : 82
Hdline Hgt (m):	3.6	Distance (km) : 5.66
Door sprd (m):	52.1	Speed (km/h) : 4.14

	Start	Finish
Time :	12:14	13:36
Depth (m) :	951	951
Latitude :	49° 34.14'	49° 30.87'
Longitude :	127° 20.14'	127° 23.86'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	341.0
Shortspine thornyhead	45.3
Flatfish	
Dover sole	31.6
Deepsea sole	18.1
Roundfish	
Atlantic salmon	162.0
Sablefish	66.7
Miscellaneous fish	
Roughscale rattail	18.9
Pectoral rattail	18.1
Filamented rattail	7.8
Twoline eelpout	7.1
Pacific flatnose	3.9
Black eelpout	3.7
Pacific hagfish	1.5
Blacktail snailfish	0.5
Northern lampfish	0.1
Poachers	0.1
Invertebrates	
Tanner crabs	21.4
Starfish	7.7
Echinoidea	7.7
Schoolmaster gonate squid	2.0
Spiny red sea star	1.0
Sea whip	0.4
Anemone	0.4
Heart urchins	0.2
Gastropods	0.1
Jellyfish	0.1
Other items	
Inanimate object(s)	2.5
Unidentified organic matter	0.7
TOTAL	**770.6 kg**

Appendix E (continued)

Set :	43	Date: 15/09/2002
Region :	D	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	84	Duration (min) : 85
Hdline Hgt (m):	4.0	Distance (km) : 6.19
Door sprd (m):	53.3	Speed (km/h) : 4.37

	Start	Finish
Time :	15:14	16:39
Depth (m) :	988	960
Latitude :	49° 30.56'	49° 32.49'
Longitude :	127° 20.06'	127° 24.35'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	182.7
Shortspine thornyhead	16.2
Flatfish	
Deepsea sole	15.2
Dover sole	6.0
Roundfish	
Sablefish	33.5
Atlantic salmon	9.0
Elasmobranchs	
Sandpaper skate	2.7
Miscellaneous fish	
Roughscale rattail	14.3
Pectoral rattail	8.0
Filamented rattail	7.0
Twoline eelpout	4.0
Pacific flatnose	1.3
Black eelpout	1.2
Blacktail snailfish	0.5
Pacific hagfish	0.1
Northern lampfish	0.1
Deepsea smelts	0.1
Invertebrates	
Tanner crabs	10.5
Starfish	7.0
Sponges	0.9
Gastropods	0.4
Anemone	0.3
Jellyfish	0.1
Scaly sea cucumber	0.1
Heart urchins	0.1
TOTAL	**321.3 kg**

Set :	44	Date: 15/09/2002
Region :	D	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	100	Duration (min) : 98
Hdline Hgt (m):	4.1	Distance (km) : 7.45
Door sprd (m):	57.4	Speed (km/h) : 4.56

	Start	Finish
Time :	18:49	20.27
Depth (m) :	695	622
Latitude :	49° 38.48'	49° 35.70'
Longitude :	127° 29.02'	127° 24.55'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	146.6
Longspine thornyhead	86.8
Shortraker rockfish	25.2
Flatfish	
Dover sole	54.8
Deepsea sole	1.2
Roundfish	
Sablefish	45.5
Elasmobranchs	
Longnose skate	12.5
Roughtail skate	3.2
Brown cat shark	1.8
Miscellaneous fish	
Pectoral rattail	9.3
Roughscale rattail	8.8
Twoline eelpout	4.1
Pacific flatnose	2.4
Black eelpout	0.8
Blacktail snailfish	0.4
Slickheads	0.2
Northern lampfish	0.1
Poachers	0.1
Invertebrates	
Schoolmaster gonate squid	24.1
Sponges	9.3
Tanner crabs	4.6
Starfish	0.9
Anemone	0.1
Sea urchins	0.1
Squids	0.1
Other items	
Fish eggs	0.1
TOTAL	**443.1 kg**

Set :	45	Date: 16/09/2002
Region :	D	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/25
Contact (min) :	102	Duration (min) : 97
Hdline Hgt (m):	4.0	Distance (km) : 6.94
Door sprd (m):	58.4	Speed (km/h) : 4.29

	Start	Finish
Time :	6:07	7.44
Depth (m) :	1134	1170
Latitude :	49° 25.72'	49° 22.79'
Longitude :	127° 19.87'	127° 22.27'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	338.3
Shortspine thornyhead	44.8
Flatfish	
Deepsea sole	14.2
Dover sole	4.8
Roundfish	
Sablefish	70.1
Miscellaneous fish	
Roughscale rattail	177.5
Pectoral rattail	48.6
Slickheads	5.5
Twoline eelpout	5.2
Pacific flatnose	5.0
Filamented rattail	2.1
Black eelpout	0.5
Northern lampfish	0.1
Invertebrates	
Tanner crabs	25.0
Starfish	1.7
Cirrata	1.1
Spiny red sea star	1.0
Anemone	0.8
Glass sponges	0.4
Sea whip	0.1
Seaslugs	0.1
Gastropods	0.1
Other items	
Inanimate object(s)	0.1
Fish eggs	0.1
TOTAL	**747.2 kg**

Appendix E (continued)

Set :	46	Date: 16/09/2002
Region :	D	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/26
Contact (min) :	78	Duration (min) : 74
Hdline Hgt (m):	3.5	Distance (km) : 5.75
Door sprd (m):	58.8	Speed (km/h) : 4.66

	Start	Finish
Time :	10:35	11:49
Depth (m) :	618	567
Latitude :	49° 38.23'	49° 40.49'
Longitude :	127° 25.66'	127° 28.94'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	122.0
Shortraker rockfish	79.9
Rougheye rockfish	5.2
Longspine thornyhead	1.1
Redbanded rockfish	0.2
Flatfish	
Dover sole	75.1
Arrowtooth flounder	1.5
Roundfish	
Sablefish	87.5
Pacific hake	4.1
Elasmobranchs	
Longnose skate	25.9
Brown cat shark	3.4
Miscellaneous fish	
Pectoral rattail	3.7
Pacific flatnose	2.5
Roughscale rattail	1.8
Black eelpout	0.8
Blacktail snailfish	0.1
Invertebrates	
Schoolmaster gonate squid	41.9
Sponges	4.1
Anemone	2.0
Starfish	1.5
Spiny red sea star	1.0
Octopus	1.0
Seaslugs	0.5
Gastropods	0.2
Sea urchins	0.1
Jellyfish	0.1
Other items	
Inanimate object(s)	2.8
Unidentified organic matter	0.8
TOTAL	**470.8 kg**

Set :	47	Date: 16/09/2002
Region :	E	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/26
Contact (min) :	80	Duration (min) : 88
Hdline Hgt (m):	3.9	Distance (km) : 7.65
Door sprd (m):	56.3	Speed (km/h) : 4.79

	Start	Finish
Time :	13:28	14:53
Depth (m) :	582	558
Latitude :	49° 44.33'	49° 46.62'
Longitude :	127° 31.82'	127° 42.52'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	210.9
Shortraker rockfish	50.3
Longspine thornyhead	19.7
Aurora rockfish	3.4
Rougheye rockfish	1.5
Flatfish	
Dover sole	160.1
Arrowtooth flounder	6.5
Rex sole	1.6
Roundfish	
Sablefish	419.8
Pacific hake	2.4
Elasmobranchs	
Longnose skate	17.5
Brown cat shark	1.5
Miscellaneous fish	
Pectoral rattail	12.3
Twoline eelpout	3.0
Pacific flatnose	1.9
Blacktail snailfish	1.5
Black eelpout	1.2
Roughscale rattail	1.0
Blackfin poacher	0.3
Poachers	0.2
Northern lampfish	0.1
Invertebrates	
Schoolmaster gonate squid	26.8
Tanner crabs	6.0
Anemone	1.4
Benthoctopus	0.5
Cirrata	0.5
Scaly sea cucumber	0.1
Starfish	0.1
Gastropods	0.1
Sponges	0.1
Other items	
Fish eggs	0.1
TOTAL	**952.4 kg**

Set :	48	Date: 16/09/2002
Region :	E	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/26
Contact (min) :	77	Duration (min) : 78
Hdline Hgt (m):	3.7	Distance (km) : 5.66
Door sprd (m):	60.6	Speed (km/h) : 4.35

	Start	Finish
Time :	16:30	17:48
Depth (m) :	622	768
Latitude :	49° 52.36'	49° 52.85'
Longitude :	127° 44.50'	127° 48.83'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	130.2
Shortraker rockfish	19.3
Longspine thornyhead	18.9
Aurora rockfish	3.6
Flatfish	
Dover sole	401.3
Arrowtooth flounder	212.8
Rex sole	8.4
Roundfish	
Sablefish	893.6
Pacific hake	25.8
Elasmobranchs	
Sandpaper skate	4.7
Brown cat shark	4.4
Miscellaneous fish	
Pectoral rattail	16.7
Pacific flatnose	5.8
Twoline eelpout	3.3
Blacktail snailfish	2.2
Blackfin poacher	0.4
Invertebrates	
Schoolmaster gonate squid	42.2
Tanner crabs	12.4
Primnoa	6.5
Starfish	0.7
Gastropods	0.4
Octopus	0.4
TOTAL	**1814.0 kg**

Appendix E (continued)

Set :	49	Date: 16/09/2002
Region :	E	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/26
Contact (min) :	65	Duration (min) : 85
Hdline Hgt (m):	4.7	Distance (km) : 6.20
Door sprd (m):	51.6	Speed (km/h) : 4.37

	Start	Finish
Time :	20:00	21:25
Depth (m) :	878	878
Latitude :	49° 51.31'	49° 54.16'
Longitude :	127° 53.13'	127° 54.11'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	122.6
Shortspine thornyhead	47.8
Flatfish	
Dover sole	11.5
Deepsea sole	3.1
Roundfish	
Sablefish	98.5
Pacific hake	1.5
Elasmobranchs	
Sandpaper skate	3.1
Miscellaneous fish	
Roughscale rattail	12.1
Filamented rattail	7.0
Pectoral rattail	2.0
Pacific flatnose	1.1
Twoline eelpout	1.0
Black eelpout	0.5
Blacktail snailfish	0.3
Pacific hagfish	0.2
Poachers	0.1
Pacific viperfish	0.1
Invertebrates	
Sponges	27.4
Schoolmaster gonate squid	8.9
Tanner crabs	7.1
Lithodes couesi	1.0
Starfish	0.5
Gastropods	0.1
TOTAL	**357.5 kg**

Set :	50	Date: 17/09/2002
Region :	E	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/26
Contact (min) :	99	Duration (min) : 102
Hdline Hgt (m):	4.1	Distance (km) : 7.50
Door sprd (m):	56.7	Speed (km/h) : 4.41

	Start	Finish
Time :	6:32	8:14
Depth (m) :	997	969
Latitude :	49° 30.22'	49° 33.09'
Longitude :	127° 40.06'	127° 43.75'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	305.0
Shortspine thornyhead	20.5
Flatfish	
Deepsea sole	1.7
Roundfish	
Sablefish	78.9
Elasmobranchs	
Roughtail skate	6.9
Miscellaneous fish	
Roughscale rattail	229.8
Pectoral rattail	45.7
Slickheads	27.1
Pacific flatnose	4.8
Twoline eelpout	2.3
Filamented rattail	1.1
Northern lampfish	0.1
Invertebrates	
Tanner crabs	5.7
Lithodes couesi	1.8
Sponges	1.6
Anemone	1.5
Starfish	1.0
Benthoctopus	1.0
Red king crab	0.5
Jellyfish	0.1
Gastropods	0.1
Other items	
Unidentified organic matter	1.5
TOTAL	**738.7 kg**

Set :	51	Date: 17/09/2002
Region :	E	Dep Zone: 1201-1600
Usable :	**Yes**	Major/Minor : 04/26
Contact (min) :	42	Duration (min) : 69
Hdline Hgt (m):	4.0	Distance (km) : 4.72
Door sprd (m):	55.6	Speed (km/h) : 3.93

	Start	Finish
Time :	10:07	11:16
Depth (m) :	1317	1445
Latitude :	49° 29.26'	49° 31.35'
Longitude :	127° 41.63'	127° 42.96'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	18.9
Shortspine thornyhead	7.8
Flatfish	
Dover sole	5.5
Deepsea sole	2.5
Roundfish	
Sablefish	10.3
Elasmobranchs	
Abyssal skate	37.4
Roughtail skate	9.0
Miscellaneous fish	
Roughscale rattail	159.4
Pectoral rattail	147.8
Pacific flatnose	38.9
Twoline eelpout	7.3
Filamented rattail	3.9
Blob sculpin	3.5
Blacktail snailfish	1.0
Slickheads	1.0
Northern lampfish	0.1
Slender blacksmelt	0.1
Crested ridgehead	0.1
Invertebrates	
Benthoctopus	3.3
Cirrata	2.2
Sand star	1.2
Paragorgia pacifica	1.1
Squids	1.0
Starfish	1.0
Sponges	1.0
Tanner crabs	1.0
Anemone	0.5
Paralomis multispina	0.4
Red king crab	0.2
Tube worms	0.2
Prawn	0.1
TOTAL	**467.7 kg**

Appendix E (continued)

Set :	52	Date: 17/09/2002
Region :	E	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/26
Contact (min) :	58	Duration (min) : 56
Hdline Hgt (m):	3.8	Distance (km) : 4.19
Door sprd (m):	58.5	Speed (km/h) : 4.49

	Start	Finish
Time :	14:34	15:30
Depth (m) :	841	951
Latitude :	49° 39.12'	49° 41.35'
Longitude :	127° 45.58'	127° 44.41'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	88.1
Shortspine thornyhead	21.0
Flatfish	
Dover sole	6.8
Deepsea sole	1.4
Roundfish	
Sablefish	35.0
Elasmobranchs	
Brown cat shark	0.5
Miscellaneous fish	
Roughscale rattail	47.7
Pectoral rattail	9.0
Slickheads	5.3
Twoline eelpout	1.6
Filamented rattail	1.4
Pacific flatnose	1.4
Blacktail snailfish	0.5
Smelts	0.1
Invertebrates	
Tanner crabs	5.5
Starfish	0.5
Octopus	0.5
Spiny red sea star	0.2
Seaslugs	0.2
Sand star	0.1
Tube worms	0.1
Gorgonian corals	0.1
TOTAL	**227.0 kg**

Set :	53	Date: 17/09/2002
Region :	E	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/26
Contact (min) :	72	Duration (min) : 66
Hdline Hgt (m):	4.0	Distance (km) : 5.10
Door sprd (m):	54.5	Speed (km/h) : 4.63

	Start	Finish
Time :	17:48	18:54
Depth (m) :	841	889
Latitude :	49° 41.77'	49° 43.12'
Longitude :	127° 39.71'	127° 43.32'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	110.2
Shortspine thornyhead	86.5
Flatfish	
Dover sole	24.6
Deepsea sole	0.6
Roundfish	
Sablefish	13.9
Elasmobranchs	
Brown cat shark	1.0
Miscellaneous fish	
Pectoral rattail	7.5
Roughscale rattail	2.9
Pacific flatnose	1.2
Northern lampfish	0.1
Pacific viperfish	0.1
Blacktail snailfish	0.1
Invertebrates	
Schoolmaster gonate squid	3.2
Tanner crabs	1.3
Aeolidiidae	0.5
Spiny red sea star	0.1
Gastropods	0.1
TOTAL	**253.9 kg**

Set :	54	Date: 18/09/2002
Region :	E	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/26
Contact (min) :	42	Duration (min) : 44
Hdline Hgt (m):	3.9	Distance (km) : 3.47
Door sprd (m):	55.0	Speed (km/h) : 4.73

	Start	Finish
Time :	6:06	6:50
Depth (m) :	549	585
Latitude :	49° 55.34'	49° 55.20'
Longitude :	127° 58.21'	128° 01.01'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	147.2
Shortraker rockfish	17.0
Longspine thornyhead	6.1
Flatfish	
Dover sole	61.7
Rex sole	3.7
Arrowtooth flounder	1.8
Roundfish	
Sablefish	18.8
Elasmobranchs	
Longnose skate	43.1
Roughtail skate	3.3
Miscellaneous fish	
Pacific flatnose	3.2
Deepsea smelts	0.1
Invertebrates	
Schoolmaster gonate squid	4.7
Tanner crabs	0.5
Spiny red sea star	0.1
TOTAL	**311.3 kg**

Appendix E (continued)

Set :	55	Date: 18/09/2002
Region :	E	Dep Zone: 501-800
Usable :	Yes	Major/Minor : 04/26
Contact (min) :	48	Duration (min) : 50
Hdline Hgt (m):	4.1	Distance (km) : 3.57
Door sprd (m):	54.4	Speed (km/h) : 4.29

	Start	Finish
Time :	7:42	8:32
Depth (m) :	585	704
Latitude :	49° 55.46'	49° 55.18'
Longitude :	127° 57.68'	127° 54.73'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	90.5
Longspine thornyhead	14.2
Shortraker rockfish	12.5
Flatfish	
Dover sole	37.9
Rex sole	7.9
Arrowtooth flounder	6.9
Roundfish	
Sablefish	70.1
Elasmobranchs	
Longnose skate	18.6
Miscellaneous fish	
Pectoral rattail	14.9
Twoline eelpout	2.3
Blacktail snailfish	2.3
Pacific flatnose	1.0
Roughscale rattail	1.0
Black eelpout	0.2
Deepsea smelts	0.1
Invertebrates	
Schoolmaster gonate squid	6.8
Tanner crabs	5.5
Cirrata	0.5
Starfish	0.1
TOTAL	**293.3 kg**

Set :	56	Date: 18/09/2002
Region :	F	Dep Zone: 501-800
Usable :	Yes	Major/Minor : 04/26
Contact (min) :	47	Duration (min) : 54
Hdline Hgt (m):	3.9	Distance (km) : 4.47
Door sprd (m):	61.1	Speed (km/h) : 5.09

	Start	Finish
Time :	12:05	12:59
Depth (m) :	519	549
Latitude :	49° 55.94'	49° 57.33'
Longitude :	128° 00.30'	128° 03.22'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	133.2
Shortraker rockfish	41.5
Longspine thornyhead	6.2
Rougheye rockfish	1.7
Flatfish	
Dover sole	71.2
Rex sole	8.8
Roundfish	
Sablefish	66.8
Elasmobranchs	
Longnose skate	23.2
Brown cat shark	0.7
Miscellaneous fish	
Pacific flatnose	2.9
Pectoral rattail	1.0
Invertebrates	
Schoolmaster gonate squid	6.2
Tanner crabs	2.0
Squids	1.0
Starfish	0.5
TOTAL	**366.9 kg**

Set :	57	Date: 18/09/2002
Region :	F	Dep Zone: 801-1200
Usable :	NO	Major/Minor : 04/26
Contact (min) :		Duration (min)
Hdline Hgt (m):		Distance (km) :
Door sprd (m)		Speed (km/h) :

	Start	Finish
Time :	14:11	14:42
Depth (m)	951	914
Latitude :	49° 57.34'	49° 57.80'
Longitude	128° 00.76'	128° 02.25'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	12.3
Shortspine thornyhead	8.0
Flatfish	
Dover sole	2.5
Roundfish	
Sablefish	40.7
Miscellaneous fish	
Pectoral rattail	1.8
Roughscale rattail	1.8
Threadfin slickhead	0.1
Slickheads	0.1
Pacific flatnose	0.1
Northern lampfish	0.1
Invertebrates	
Sponges	1.0
Schoolmaster gonate squid	0.7
Jellyfish	0.5
Starfish	0.1
Gastropods	0.1
TOTAL	**69.9 kg**

Appendix E (continued)

Set :	58	Date: 20/09/2002
Region :	F	Dep Zone: 801-1200
Usable :	Yes	Major/Minor : 04/27
Contact (min) :	69	Duration (min) : 76
Hdline Hgt (m):	3.8	Distance (km) : 5.50
Door sprd (m):	58.7	Speed (km/h) : 4.42

	Start	Finish
Time :	7:55	9:11
Depth (m) :	1061	1134
Latitude :	50° 14.29'	50° 13.34'
Longitude :	128° 22.64'	128° 26.89'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	45.7
Shortspine thornyhead	12.3
Flatfish	
Dover sole	8.8
Deepsea sole	1.7
Roundfish	
Sablefish	50.0
Elasmobranchs	
Roughtail skate	6.5
Miscellaneous fish	
Roughscale rattail	318.6
Pectoral rattail	103.7
Filamented rattail	11.2
Pacific flatnose	2.7
Twoline eelpout	2.1
Slickheads	1.0
Dreamers	0.5
Lumpfishes and snailfishes	0.4
Pacific viperfish	0.1
Longfin dragonfish	0.1
Deepsea smelts	0.1
Northern lampfish	0.1
Invertebrates	
Echinoidea	2.6
Tanner crabs	2.6
Sea whip	1.8
Cirrata	1.0
Anemone	1.0
Benthoctopus	1.0
Starfish	0.5
Seaslugs	0.5
Jellyfish	0.1
Gastropods	0.1
TOTAL	576.8 kg

Set :	59	Date: 20/09/2002
Region :	F	Dep Zone: 801-1200
Usable :	Yes	Major/Minor : 04/27
Contact (min) :	63	Duration (min) : 72
Hdline Hgt (m):	4.0	Distance (km) : 5.64
Door sprd (m):	56.9	Speed (km/h) : 4.70

	Start	Finish
Time :	11:22	12:34
Depth (m) :	841	1061
Latitude :	50° 15.86'	50° 14.07'
Longitude :	128° 22.29'	128° 25.87'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	425.6
Shortspine thornyhead	65.2
Flatfish	
Dover sole	59.4
Deepsea sole	3.2
Roundfish	
Sablefish	197.7
Elasmobranchs	
Sandpaper skate	0.1
Miscellaneous fish	
Roughscale rattail	59.8
Pectoral rattail	28.2
Filamented rattail	4.3
Slickheads	0.5
Northern lampfish	0.5
Invertebrates	
Tanner crabs	6.7
Lithodes couesi	1.5
Red king crab	1.0
Octopus	0.9
Glass sponges	0.7
Schoolmaster gonate squid	0.5
Sea urchins	0.1
Echinoidea	0.1
TOTAL	856.0 kg

Set :	60	Date: 20/09/2002
Region :	F	Dep Zone: 801-1200
Usable :	Yes	Major/Minor : 04/27
Contact (min) :	61	Duration (min) : 60
Hdline Hgt (m):	3.7	Distance (km) : 5.08
Door sprd (m):	58.3	Speed (km/h) : 5.08

	Start	Finish
Time :	14:08	15:08
Depth (m) :	878	1006
Latitude :	50° 10.74'	50° 09.44'
Longitude :	128° 31.45'	128° 27.92'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	225.9
Shortspine thornyhead	55.8
Flatfish	
Deepsea sole	2.3
Dover sole	0.6
Roundfish	
Sablefish	108.2
Elasmobranchs	
Roughtail skate	9.0
Miscellaneous fish	
Roughscale rattail	24.6
Pectoral rattail	10.1
Slickheads	0.5
Pacific flatnose	0.2
Northern lampfish	0.1
Invertebrates	
Sponges	3.0
Tanner crabs	2.8
Spiny red sea star	0.5
Glass sponges	0.3
Red king crab	0.2
Echinoidea	0.1
Coeclenterates	0.1
TOTAL	444.3 kg

Appendix E (continued)

Set :	61	Date: 20/09/2002
Region :	F	Dep Zone: 801-1200
Usable :	Yes	Major/Minor : 04/27
Contact (min) :	59	Duration (min) : 68
Hdline Hgt (m):	3.5	Distance (km) : 5.59
Door sprd (m):	58.4	Speed (km/h) : 4.94

	Start	Finish
Time :	16:39	17:47
Depth (m) :	951	1024
Latitude :	50° 09.30'	50° 06.63'
Longitude :	128° 25.91'	128° 23.88'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	265.7
Shortspine thornyhead	77.9
Flatfish	
Deepsea sole	2.6
Dover sole	1.2
Roundfish	
Sablefish	169.1
Elasmobranchs	
Roughtail skate	0.3
Miscellaneous fish	
Roughscale rattail	11.2
Pectoral rattail	3.0
Filamented rattail	1.1
Threadfin slickhead	0.5
Pacific flatnose	0.5
Black eelpout	0.1
Invertebrates	
Tanner crabs	6.2
Glass sponges	2.0
Schoolmaster gonate squid	0.8
Coeclenterates	0.5
Paralomis multispina	0.5
Squat lobster	0.1
Other items	
Inanimate object(s)	10.3
TOTAL	**553.6 kg**

Set :	62	Date: 20/09/2002
Region :	F	Dep Zone: 1201-1600
Usable :	NO	Major/Minor : 04/27
Contact (min) :		Duration (min) :
Hdline Hgt (m):		Distance (km) :
Door sprd (m):		Speed (km/h) :

	Start	Finish
Time :	20:34	20:50
Depth (m) :	1390	
Latitude :	50° 02.01'	50° 02.16'
Longitude :	128° 06.82'	128° 08.00'

** Catch was not sampled **

Set :	63	Date: 21/09/2002
Region :	E	Dep Zone: 1201-1600
Usable :	Yes	Major/Minor : 04/26
Contact (min) :	66	Duration (min) : 77
Hdline Hgt (m):	4.0	Distance (km) : 5.43
Door sprd (m):	57.7	Speed (km/h) : 4.20

	Start	Finish
Time :	1:54	3:11
Depth (m) :	1353	1189
Latitude :	49° 35.11'	49° 32.83'
Longitude :	127° 47.48'	127° 45.64'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	11.6
Longspine thornyhead	10.4
Flatfish	
Deepsea sole	2.0
Elasmobranchs	
Abyssal skate	21.8
Roughtail skate	0.1
Miscellaneous fish	
Roughscale rattail	224.1
Pectoral rattail	64.0
Pacific flatnose	31.1
Deepsea smelts	0.8
Slickheads	0.5
Filamented rattail	0.5
Northern lampfish	0.1
Invertebrates	
Starfish	1.1
Paralomis multispina	0.4
Prawn	0.1
TOTAL	**368.6 kg**

Appendix E (continued)

Set :	64	Date: 21/09/2002
Region :	F	Dep Zone: 501-800
Usable :	Yes	Major/Minor : 04/26
Contact (min) :	58	Duration (min) : 57
Hdline Hgt (m):	3.9	Distance (km) : 5.09
Door sprd (m):	58.4	Speed (km/h) : 5.35

	Start	Finish
Time :	8:05	9:02
Depth (m) :	530	567
Latitude :	49° 55.50'	49° 57.21'
Longitude :	128° 02.88'	128° 06.09'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	173.5
Shortraker rockfish	56.8
Longspine thornyhead	49.4
Rougheye rockfish	3.1
Aurora rockfish	0.9
Flatfish	
Dover sole	92.4
Arrowtooth flounder	14.7
Deepsea sole	8.8
Rex sole	2.0
Roundfish	
Sablefish	61.4
Elasmobranchs	
Longnose skate	9.0
Miscellaneous fish	
Roughscale rattail	5.4
Pacific flatnose	4.9
Pectoral rattail	1.0
Black eelpout	0.5
Longfin dragonfish	0.1
Invertebrates	
Anemone	8.1
Schoolmaster gonate squid	2.2
Starfish	1.0
Tanner crabs	0.9
Squids	0.5
Lithodes couesi	0.2
Kelp crab	0.1
TOTAL	**496.9 kg**

Set :	65	Date: 21/09/2002
Region :	F	Dep Zone: 501-800
Usable :	Yes	Major/Minor : 04/26
Contact (min) :	46	Duration (min) : 55
Hdline Hgt (m):	5.8	Distance (km) : 4.31
Door sprd (m):	57.8	Speed (km/h) : 4.71

	Start	Finish
Time :	10:15	11:10
Depth (m) :	567	622
Latitude :	49° 57.35'	49° 57.94'
Longitude :	128° 04.02'	128° 06.82'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	93.4
Shortraker rockfish	53.8
Longspine thornyhead	21.9
Aurora rockfish	2.6
Flatfish	
Dover sole	44.4
Arrowtooth flounder	2.4
Roundfish	
Sablefish	28.8
Elasmobranchs	
Longnose skate	6.6
Brown cat shark	0.3
Miscellaneous fish	
Pectoral rattail	1.3
Pacific flatnose	1.2
Deepsea smelts	0.1
Northern lampfish	0.1
Sand lances	0.1
Lumpfishes and snailfishes	0.1
Black eelpout	0.1
Invertebrates	
Schoolmaster gonate squid	3.2
Robust clubhook squid	2.4
Tanner crabs	0.5
Lithodes couesi	0.5
Spiny red sea star	0.2
Gorgonian corals	0.1
Starfish	0.1
Other items	
Unidentified organic matter	0.5
TOTAL	**264.7 kg**

Set :	66	Date: 21/09/2002
Region :	F	Dep Zone: 501-800
Usable :	Yes	Major/Minor : 04/26
Contact (min) :	52	Duration (min) : 53
Hdline Hgt (m):	3.9	Distance (km) : 4.24
Door sprd (m):	59.7	Speed (km/h) : 4.80

	Start	Finish
Time :	12:24	13:17
Depth (m) :	512	521
Latitude :	49° 56.14'	49° 55.69'
Longitude :	127° 59.13'	128° 02.51'

Species	Wgt (kg)
Rockfish	
Shortraker rockfish	178.0
Shortspine thornyhead	126.4
Longspine thornyhead	14.5
Rougheye rockfish	12.3
Aurora rockfish	0.3
Flatfish	
Dover sole	107.6
Arrowtooth flounder	36.2
Rex sole	16.3
Roundfish	
Sablefish	39.2
Elasmobranchs	
Longnose skate	21.9
Miscellaneous fish	
Longfin dragonfish	0.5
Lanternfishes	0.1
Snipe eels	0.1
Invertebrates	
Schoolmaster gonate squid	9.5
Tanner crabs	1.0
Anemone	0.2
Spiny red sea star	0.1
Squids	0.1
TOTAL	**564.3 kg**

Appendix E (continued)

Set :	67	Date: 21/09/2002
Region :	F	Dep Zone: 1201-1600
Usable :	Yes	Major/Minor : 04/27
Contact (min) :	33	Duration (min) : 33
Hdline Hgt (m):	2.0	Distance (km) : 2.72
Door sprd (m):	39.8	Speed (km/h) : 4.95

	Start	Finish
Time :	14:44	15:17
Depth (m) :	1399	1426
Latitude :	50° 01.94'	50° 02.46'
Longitude :	128° 07.16'	128° 08.35'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	0.7
Longspine thornyhead	0.5
Flatfish	
Deepsea sole	9.3
Elasmobranchs	
Roughtail skate	2.4
Miscellaneous fish	
Roughscale rattail	4.0
Pectoral rattail	1.4
Deepsea smelts	0.1
Invertebrates	
Sea urchins	477.8
Benthoctopus	10.8
Starfish	5.4
Tanner crabs	4.6
Anemone	4.4
Spiny red sea star	1.0
Bivalve molluscs	1.0
Brittle stars	0.6
Heart urchins	0.1
Gastropods	0.1
Other items	
Unidentified organic matter	1.0
Fish eggs	0.5
TOTAL	**525.7 kg**

Set :	68	Date: 21/09/2002
Region :	F	Dep Zone: 1201-1600
Usable :	Yes	Major/Minor : 04/27
Contact (min) :	73	Duration (min) : 75
Hdline Hgt (m):	3.9	Distance (km) : 5.19
Door sprd (m):	57.3	Speed (km/h) : 4.16

	Start	Finish
Time :	18:12	19:27
Depth (m) :	1308	1289
Latitude :	50° 02.94'	50° 00.51'
Longitude :	128° 24.24'	128° 22.71'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	57.6
Shortspine thornyhead	10.3
Flatfish	
Deepsea sole	1.8
Elasmobranchs	
Abyssal skate	100.8
Roughtail skate	8.2
Miscellaneous fish	
Roughscale rattail	187.6
Pectoral rattail	109.6
Pacific flatnose	50.0
Filamented rattail	6.5
Blob sculpin	2.2
Twoline eelpout	1.6
Dreamers	0.3
Deepsea smelts	0.3
Lumpfishes and snailfishes	0.3
Invertebrates	
Ophiuroidea	36.2
Sea whip	6
Paralomis multispina	4.2
Tanner crabs	1.2
Schoolmaster gonate squid	0.7
Starfish	0.6
Squids	0.2
Prawn	0.1
Other items	
Inanimate object(s)	0.5
TOTAL	**586.8 kg**

Set :	69	Date: 22/09/2002
Region :	G	Dep Zone: 1201-1600
Usable :	Yes	Major/Minor : 04/27
Contact (min) :	57	Duration (min) : 61
Hdline Hgt (m):	3.7	Distance (km) : 4.54
Door sprd (m):	58.4	Speed (km/h) : 4.47

	Start	Finish
Time :	7:00	8:01
Depth (m) :	1280	1262
Latitude :	50° 15.08'	50° 16.86'
Longitude :	128° 41.79'	128° 43.42'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	27.2
Shortspine thornyhead	9.4
Flatfish	
Deepsea sole	1.0
Roundfish	
Sablefish	3.1
Elasmobranchs	
Abyssal skate	2.3
Roughtail skate	1.8
Miscellaneous fish	
Roughscale rattail	204.5
Pacific flatnose	35.9
Lumpfishes and snailfishes	0.4
Twoline eelpout	0.1
Northern lampfish	0.1
Invertebrates	
Ophiuroidea	283.0
Sea whip	7.0
Anemone	2.5
Spiny red sea star	2.0
Benthoctopus	1.2
Sand star	1.0
Sponges	0.5
Squids	0.5
Glass sponges	0.4
Starfish	0.3
Sea urchins	0.1
Jellyfish	0.1
Other items	
Unidentified organic matter	0.2
Fish eggs	0.1
TOTAL	**584.7 kg**

Appendix E (continued)

Set :	70	Date: 22/09/2002
Region :	G	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/27
Contact (min) :	64	Duration (min) : 64
Hdline Hgt (m):	3.9	Distance (km) : 4.99
Door sprd (m):	58.6	Speed (km/h) : 4.68

	Start	Finish
Time :	10:00	11:04
Depth (m) :	1070	1170
Latitude :	50° 15.24'	50° 16.44'
Longitude :	128° 36.93'	128° 40.47'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	211.9
Shortspine thornyhead	18.5
Flatfish	
Deepsea sole	1.2
Roundfish	
Sablefish	84.6
Elasmobranchs	
Roughtail skate	2.5
Miscellaneous fish	
Roughscale rattail	176.5
Pectoral rattail	9.2
Pacific flatnose	2.4
Slickheads	0.5
Deepsea smelts	0.2
Black eelpout	0.2
Northern lampfish	0.1
Invertebrates	
Glass sponges	5.2
Tanner crabs	1.9
Alaskan king crabs	0.9
Schoolmaster gonate squid	0.4
Anemone	0.3
Spiny red sea star	0.2
Coeclenterates	0.1
Scaly sea cucumber	0.1
Other items	
Fish eggs	0.1
TOTAL	**517.0 kg**

Set :	71	Date: 22/09/2002
Region :	G	Dep Zone: 1201-1600
Usable :	**Yes**	Major/Minor : 04/27
Contact (min) :	55	Duration (min) : 65
Hdline Hgt (m):	3.9	Distance (km) : 4.91
Door sprd (m):	55.6	Speed (km/h) : 4.53

	Start	Finish
Time :	13:35	14:40
Depth (m) :	1317	1298
Latitude :	50° 16.89'	50° 17.35'
Longitude :	128° 37.27'	128° 40.96'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	13.5
Shortspine thornyhead	3.5
Flatfish	
Dover sole	4.4
Deepsea sole	2.9
Roundfish	
Sablefish	9.6
Elasmobranchs	
Abyssal skate	1.8
Miscellaneous fish	
Roughscale rattail	136.0
Pectoral rattail	53.4
Pacific flatnose	22.0
Filamented rattail	4.5
Deepsea smelts	0.1
Crested ridgehead	0.1
Northern lampfish	0.1
Invertebrates	
Ophiuroidea	2.0
Starfish	0.8
Sea whip	0.8
Sponges	0.5
Sand star	0.5
Spiny red sea star	0.4
Anemone	0.2
Polychaete worms	0.1
Squat lobster	0.1
Other items	
Unidentified organic matter	0.4
TOTAL	**257.7 kg**

Set :	72	Date: 22/09/2002
Region :	G	Dep Zone: 801-1200
Usable :	**Yes**	Major/Minor : 04/27
Contact (min) :	46	Duration (min) : 65
Hdline Hgt (m):	3.9	Distance (km) : 5.08
Door sprd (m):	56.6	Speed (km/h) : 4.62

	Start	Finish
Time :	17:56	19:01
Depth (m) :	933	1189
Latitude :	50° 19.35'	50° 17.16'
Longitude :	128° 21.97'	128° 23.99'

Species	Wgt (kg)
Rockfish	
Longspine thornyhead	107.1
Shortspine thornyhead	42.6
Flatfish	
Dover sole	100.0
Deepsea sole	6.5
Roundfish	
Sablefish	123.9
Elasmobranchs	
Roughtail skate	19.4
Miscellaneous fish	
Roughscale rattail	110.5
Pectoral rattail	34.2
Filamented rattail	29.4
Pacific flatnose	4.8
Lumpfishes and snailfishes	2.5
Black eelpout	1.0
Pacific hagfish	1.0
Twoline eelpout	0.9
Manacled sculpin	0.5
Invertebrates	
Tanner crabs	5.6
Anemone	1.5
Schoolmaster gonate squid	1.2
Ophiuroidea	1.1
Starfish	1.0
Coeclenterates	0.5
Scaly sea cucumber	0.2
Other items	
Unidentified organic matter	6.6
TOTAL	**602.0 kg**

Appendix E (continued)

Set :	73	Date: 22/09/2002
Region :	G	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/27
Contact (min) :	42	Duration (min) : 43
Hdline Hgt (m):	3.6	Distance (km) : 3.99
Door sprd (m):	56.7	Speed (km/h) : 5.57

	Start	Finish
Time :	20:34	21:17
Depth (m) :	585	768
Latitude :	50° 18.40'	50° 17.07'
Longitude :	128° 18.91'	128° 21.60'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	181.7
Shortraker rockfish	85.8
Longspine thornyhead	81.4
Rougheye rockfish	2.6
Aurora rockfish	1.3
Flatfish	
Dover sole	163.9
Rex sole	12.1
Deepsea sole	0.5
Roundfish	
Sablefish	224.4
Pacific hake	3.2
Elasmobranchs	
Abyssal skate	12.4
Roughtail skate	5.8
Longnose skate	5.4
Sandpaper skate	1.9
Brown cat shark	0.2
Miscellaneous fish	
Pectoral rattail	41.9
Pacific flatnose	2.7
Black eelpout	0.3
Northern lampfish	0.1
Invertebrates	
Schoolmaster gonate squid	29.7
Sponges	1.1
Starfish	0.3
Gastropods	0.2
Anemone	0.2
Heart urchins	0.1
Spiny red sea star	0.1
Brittle stars	0.1
Sea urchins	0.1
TOTAL	**859.5 kg**

Set :	74	Date: 23/09/2002
Region :	G	Dep Zone: 501-800
Usable :	**Yes**	Major/Minor : 04/27
Contact (min) :	61	Duration (min) : 65
Hdline Hgt (m):	6.2	Distance (km) : 5.02
Door sprd (m):	58.6	Speed (km/h) : 4.63

	Start	Finish
Time :	7:45	8:50
Depth (m) :	622	1006
Latitude :	50° 19.72'	50° 18.18'
Longitude :	128° 24.85'	128° 27.75'

Species	Wgt (kg)
Rockfish	
Shortspine thornyhead	135.5
Longspine thornyhead	73.3
Shortraker rockfish	25.0
Flatfish	
Dover sole	161.1
Deepsea sole	3.6
Rex sole	1.3
Roundfish	
Sablefish	117.0
Pacific hake	1.4
Elasmobranchs	
Roughtail skate	6.3
Brown cat shark	0.5
Miscellaneous fish	
Pectoral rattail	47.9
Twoline eelpout	8.4
Roughscale rattail	1.9
Pacific flatnose	1.5
Deepsea smelts	0.5
Northern lampfish	0.5
Filamented rattail	0.5
Blacktail snailfish	0.5
Black eelpout	0.2
Sand lances	0.1
Snipe eels	0.1
Blackfin poacher	0.1
Invertebrates	
Schoolmaster gonate squid	7.3
Scaly sea cucumber	0.5
Sea urchins	0.5
Anemone	0.5
Gorgonian corals	0.5
Gastropods	0.2
Squat lobster	0.1
Other items	
Unidentified organic matter	18.5
TOTAL	**615.3 kg**

APPENDIX E (continued)

Notes pertaining to haul information:

Dep Zone: depth stratum limits (metres).

Usable: indicates whether the tow was considered usable for biomass estimation.

Major/Minor: Major Area and Minor Area codes used for DFO groundfish fisheries management purposes.

Contact: bottom contact time (minutes) is the elapsed time between first contact with bottom as the net began fishing and the time when the net finally left bottom during retrieval. These start/end times were based on tilt angle changes using 45° as the cutoff angle between vertical and horizontal sensor orientation.

Duration: elapsed time (minutes) between winch lockup as the fishing event began until the time that the winch was released to start retrieving the gear.

Hdline Hgt: average height (metres) of the headline above the footrope, based on interval data from winch lock to winch release during each tow.

Distance: estimated distance (km) that the gear was towed along bottom, calculated from summation of interval distances from winch lock to winch release during each tow (see Eq. 3).

Door sprd: average distance (m) between the trawl doors, based on interval data from winch lock to winch release during each tow.

Speed: average vessel speed (km/h) during the tow, based on interval data from winch lock to winch release during each tow.